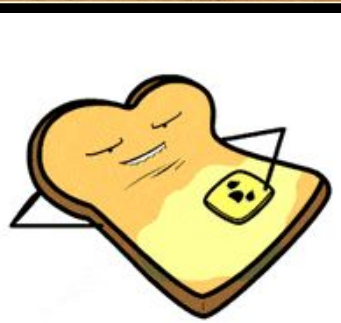
LIPIDS

in Food & Cooking



LIPIDS

vs. CARBOHYDRATES

Only lipids:

Do not dissolve in water

Do not provide structure to food products

BOTH: CARBON, HYDROGEN, OXYGEN

- Fats
- Oils
- Shortening
- Phospholipids
- Sterols

Fat

- Solid at room temperature
- Generally highly saturated

Oil

- Liquid at room temperature
- Generally mono or polyunsaturated

Hydrogenated Products

- Adding hydrogen to unsaturated lipid to increase saturation
- Makes liquid oil solid

Physical States of Lipids

Melting Point:

- Temperature which changes a solid to a liquid
- Dependent on amount of saturation
- Changes cooking properties

Solidification Point:

- Temp which all lipids in a mixture are in a solid state
- Refrigerated olive oil may solidify
- Causes cloudiness in refrigerated homemade dressings

Melting vs Solidification Points

Role of Fats (lipids) in Cooking

Six top reasons why fat is used in cooking

1. Fats serve as a <u>medium for heat transfer</u>

Deep Frying is usually a combination of carbohydrate and fat items, with fat acting as the heat

Smoke Point

The temperature at which fatty acids break apart and produce smoke (every fat is different)

Flash Point

Temperature at which product will flame

The Role of Fats in Cooking

SMOKE POINTS OF FAT

TYPE OF FAT	SMOKE POINT
Safflower Oil	510°F/265°C
Rice Bran Oil	490°F/260°C
Light/Refined Olive Oil	465°F/240°C
Soybean Oil	450°F/230°C
Peanut Oil	450°F/230°C
Clarified Butter	450°F/230°C
Corn Oil	450°F/230°C
Sunflower Oil	440°F/225°C
Vegetable Oil	400-450°F/205-230°C
Beef Tallow	400°F/250°C
Canola Oil	400°F/205°C
Lard	370°F/185°C
Avocado Oil (Virgin)	375-400°F/190-205°C
Chicken Fat (Schmaltz)	375°F/190°C
Duck Fat	375°F/190°C
Vegetable Shortening	360°F/180°C
Sesame Oil	350-410°F/175-210°C
Butter	350°F/175°C
Coconut Oil	350°F/175°C
Extra-Virgin Olive Oil	325-375°F/165-190°C

> *"The higher a fat's smoke point, the more cooking methods you can use it for.*

READ this Serious Eats article:

What's a Smoke Point and Why Does it Matter?

2. Tenderizer:

- Fat shortens the molecule strands caused by flour
- Results in a more tender product
- Reason behind "shortening" name

The Role of Fats in Cooking

3. **Aerator**
   - Fat allows tiny bubbles to form when batters are beaten

4. **Enhance Flavor**
   - Fat dissolves and disperses flavor compounds from other ingredients, such as vegetables

The Role of Fats in Cooking

5. Lubricate food components

Makes meat easier to chew

Marbling:

- Specks or streaks of fat in muscle tissue
- More marbling, more tender

Makes other foods seem to have more moisture

Ex. Mayo or butter on sandwiches

The Role of Fats in Cooking

6. Serve as liquids in **emulsions**

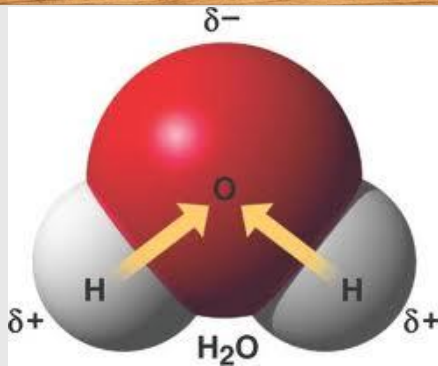
Definition: Mixture that contains a nonpolar lipid & a water-based liquid

Water: Polar (unequal sharing of electrons)

Polar compounds will combine easily with each other

Lipids: Non-polar (equal or balanced sharing of electrons)

The Role of Fats in Cooking



Examples of **Emulsions:**

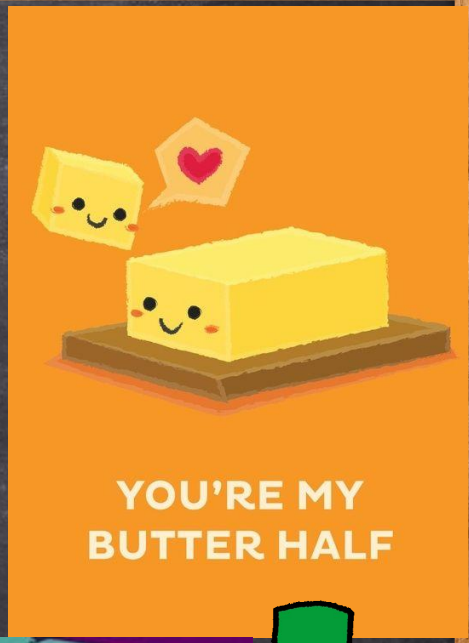
Butter

Milk

Bottled salad dressings

Hollandaise sauce

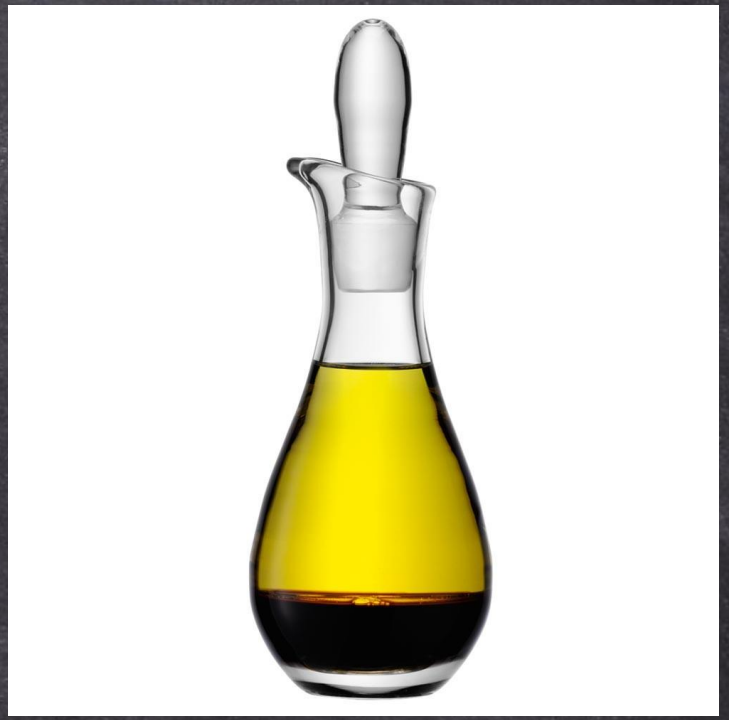
Mayonnaise



Emulsions

Example of Non-Emulsion:

Oil and Vinegar



Emulsions

How does an emulsion happen?

Mixture will not stay mixed unless a compound that has a polar and non-polar end

Example:

- Egg yolks prevent oil and water from separating in mayo

https://www.youtube.com/watch?v=7Qi2Kzru36Q

EMULSION

a mixture of hydrophillic and hydrophobic liquids

[Emulsifiers'] construct involves both hydrophobic and hydrophilic components—therefore, they can be the perfect bridge between water and oil.
-Julia Stewart

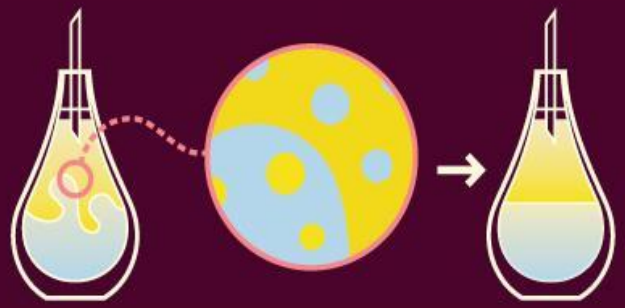
PROCESS

vinaigrette

water-based + **oil** =

(hydro**phillic**) **emulsifier** ("binder") (hydro**phobic**)

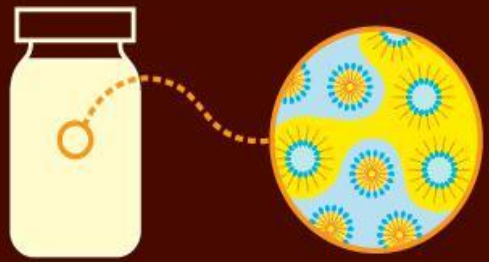
unstable mix/emulsion - **separates**



mayonnaise

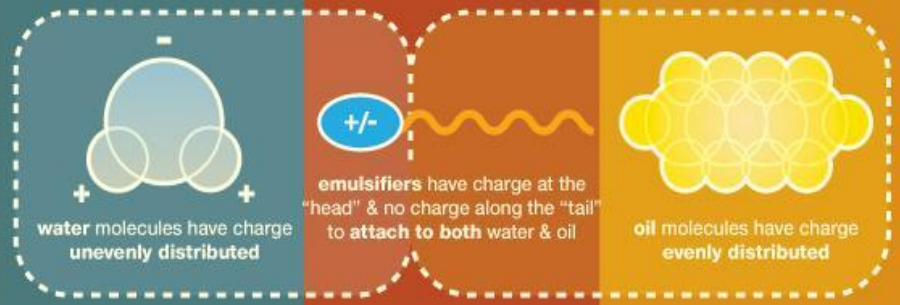
polar + both **polar** & **non**-polar + **non**-polar =

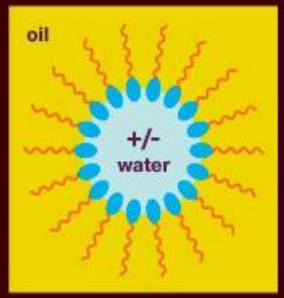
stable mix/emulsion - **doesn't separate**

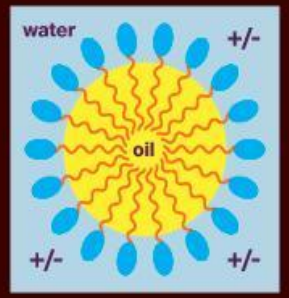


emulsifiers **surround** water and oil droplets within another liquid and prevent them from recombining or separating

molecular level







IOANA

Potential Problems with Fat in Food

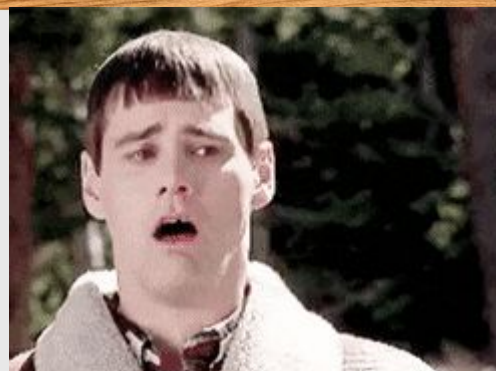
Auto-oxidation:

- Complex chain reaction when lipids are exposed to oxygen; causes lipids to deteriorate
- More likely to occur in unsaturated oils

Rancidity:

- Form of food spoilage; not necessarily harmful to health, but has potential to be depending on product/time
- Unappetizing color and flavor changes

Problems with Fat in Food



Prevention of Auto-oxidation & Rancidity

- Reduce oxygen exposure
- Adding antioxidants

  (ex. Vitamins A, C, and E)

Make it Stop!

Functions of Lipids in Foods

Name:

Food Science, 8 points

Physical States of Lipids

- **Fat**
  - _____ at room temperature
  - Generally highly _____
- **Oil**
  - _____ at room temperature
  - Generally _____

Review & Explore: Submit to Canvas

Due Tuesday