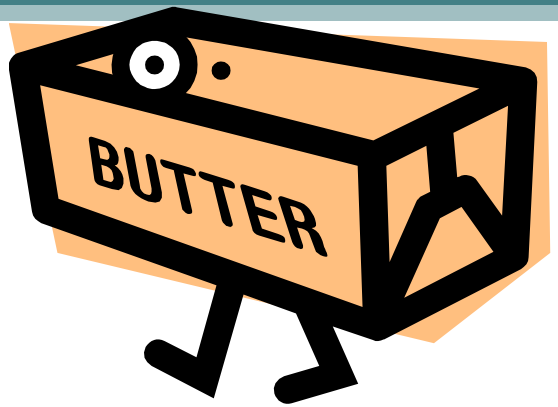
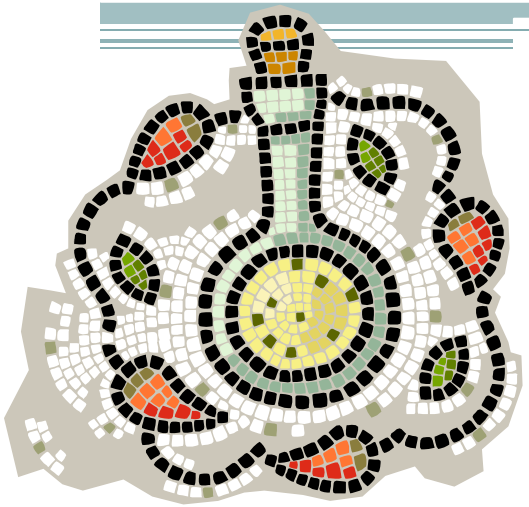
LIPIDS





FATS VS CARBOHYDRATES

COMPARISON

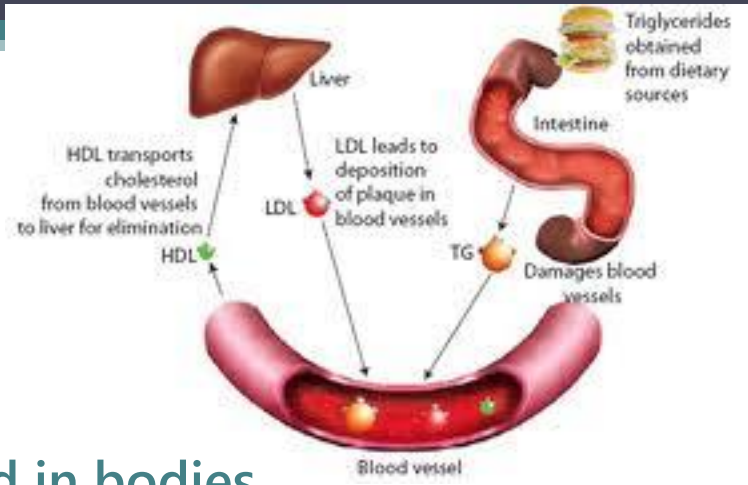
Only lipids:
Do not dissolve in water
Do not provide structure to food products

CARBON
BOTH: HYDROGEN
OXYGEN

LIPIDS vs. CARBOHYDRATES

Fats
Oils
Shortening
Phospholipids
Sterols

3 general types:



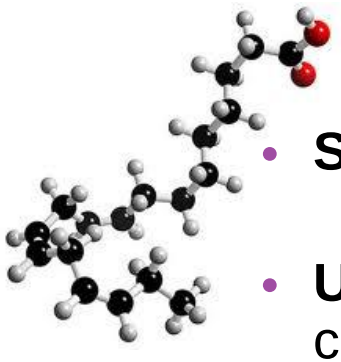
1. **Triglycerides**
   - Major type of fat found in food and in bodies

2. **Phospholipids**
   - In body: Carry food back and forth across cell membranes
   - In food: Help fats stay in water-based solution (Ex. Mayo)

3. **Sterols (cholesterol)**
   - Molecules derived or made from lipids
   - Cholesterol (found in every cell in the body)
   - Vit D, steroid hormones, sex hormones

Fatty Acids

- Organic molecules that consist of a carbon chain with a **carboxyl group** (C atom + 2 O atoms + 1 H atom)
- Depending on the bonds, food characteristics are affected:
  - Cooking performance, shelf life, nutritional value



- **Saturated fatty acids** – Do not contain double bonds
- **Unsaturated fatty acids**- Some double bonds between carbon atoms in this molecule.
- **Monounsaturated fatty acids**- only 1 double bond in this molecule between 2 carbon atoms.

Physical States of Lipids

- Fat
  - Solid at room temperature
  - Generally highly saturated

- Oil
  - Liquid at room temperature
  - Generally mono or polyunsaturated

- Hydrogenated Products
  - Adding hydrogen atoms to an unsaturated lipid to increase saturation
  - Makes liquid oil solid

Melting vs Solidification Points

Melting Point:

- Temp 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

The Role of Fats in Cooking

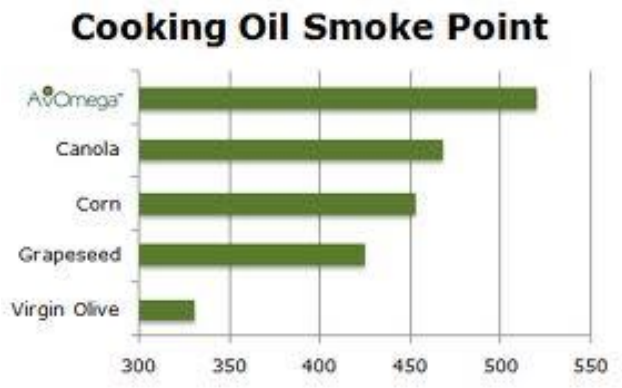
Fats serve as a **medium for heat transfer**

Smoke Point

- The temperature at which fatty acids break apart and produce smoke
- Every fat is different

Flash Point

- Temp at which product will flame



Deep Frying: Usually a combination of carb and fat items.

The Role of Fats in Cooking

Tenderize:

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

The Role of Fats in Cooking

Aerate

- Fat allows tiny bubbles to form when batters are beaten

Enhance Flavor

- Fat dissolves and disperses flavor compounds from other ingredients, such as vegetables

The Role of Fats in Cooking

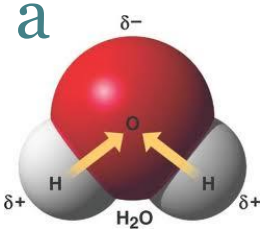
Lubricate food components

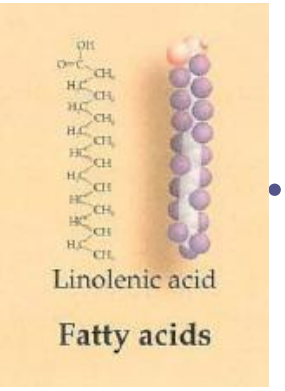
- Makes meat easier to chew
  - Marbling:
    - Specks or streaks of fat in muscle tissue
    - More marbling, more tender
- Makes other foods seem to have more moisture
  - Ex. Mayo or butter on sandwiches

The Role of Fats in Cooking

Serve as liquids in **emulsions**

- Mixture that contains a non-polar lipid and 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)

Example of Non-Emulsion: Oil and Vinegar

How does an emulsion happen?

- Mixture will not stay mixed unless a compound that has a polar and non-polar end
- Examples:
  - Egg yolks (contains phospholipid lecithin) prevents oil and water from separating
  - Other emulsions: Butter, milk, bottled salad dressings, hollandaise sauce

EMULSION

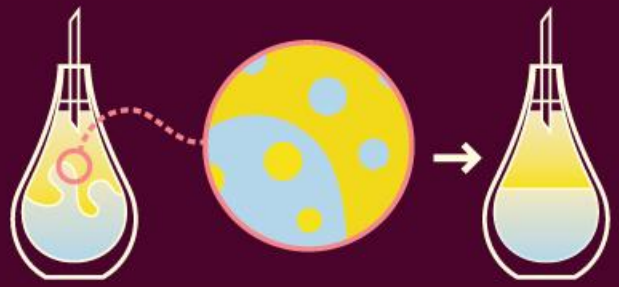
a mixture of hydrophillic and hydrophobic liquids

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

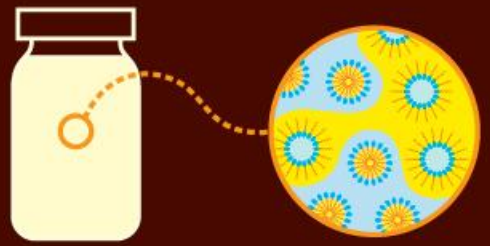
PROCESS

	water-based		oil	
vinaigrette		+		=
	(hydrophillic)	emulsifier ("binder")	(hydrophobic)	
mayonnaise		+  +		=
	polar	both polar & non-polar	non-polar	

unstable mix/emulsion - **separates**

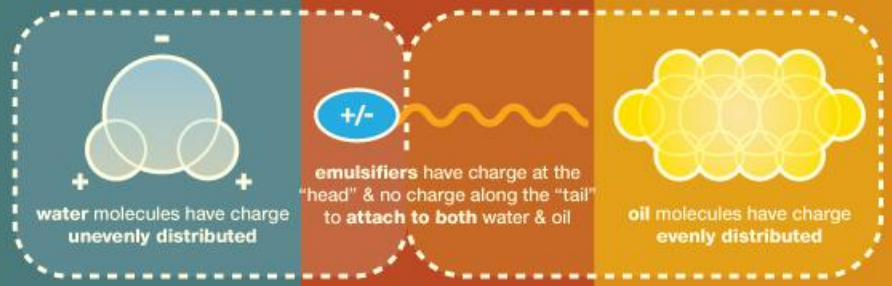


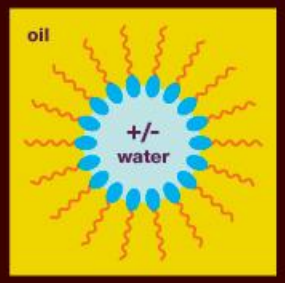
stable mix/emulsion - **doesn't separate**

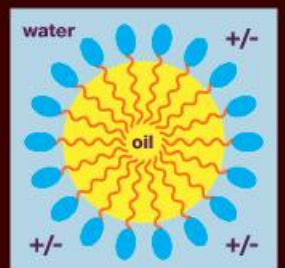


emulsifiers **surround** water and oil droplets within another liquid and prevent them from recombining or separating

molecular level







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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 can be
  - Unappetizing color and flavor changes

- Prevention:
  - Reduce oxygen exposure
  - Adding antioxidants (ex. Vitamins A, C, and E)