The Science of Fast Food Hamburgers

Ingredients

Regular Bun (top)
Natural: enriched flour, water, yeast, soybean or canola oil, salt, wheat gluten
Artificial: high fructose corn syrup, calcium sulfate, calcium carbonate, ammonium sulfate, ammonium chloride, dough conditioners, sorbic acid, calcium propionate, soy lecithin

Ketchup
Natural: tomatoes, distilled vinegar, water, salt
Artificial: high fructose corn syrup, natural flavors

Mustard
Natural: distilled vinegar, water, mustard seed, salt, turmeric, paprika, spice extractive

Pickles
Natural: cucumber, water, distilled vinegar, salt, natural flavors, turmeric
Artificial: calcium chloride, alum, potassium sorbate, polysorbate 80

Onions
Natural: chopped onions

100% Beef Patty
Natural: 80% ground chuck, salt, black pepper, onion powder
Artificial: Accent (monosodium glutamate)

Regular Bun (bottom)

The Science of Hamburger Meat

1. Most burgers are made from ground chuck
2. Ground chuck comes from the cow’s shoulder
3. It is 80% meat and 20% fat → Fat tastes good

Bring the Heat

Raw meat contains bacteria
Heat kills bacteria
Cook ground beef to 160°F to kill the bacteria

Hamburger Assembly: The Fast Food Method

1. Cooking the burger
   Searing: cook at high temperature to get a dark brown crust on outside
   Season with Special Seasoning

2. Assemble the burger
   Toast the bun
   Five squirts of ketchup and mustard
   Onions and pickles added
   Wrap the burger

3. Re-heat the burger under a heat lamp
   Moo.
**The Science of Carbonation**

1. **Soda bubbles are made from carbon dioxide (CO2)**
2. CO2 gas is dissolved in water under high pressure, such as in a closed soda bottle.
3. The gas stays in the water until the pressure is reduced, such as when you open the soda bottle.
4. Gas comes out as bubbles.

**Most Popular Brands**

- Coke: 44.9%
- Diet Coke: 17%
- Pepsi: 9.9%
- Mountain Dew: 9.5%
- Dr. Pepper: 6.8%
- Sprite: 6.3%
- Other: 5.6%

*Source: Beverage Digest*

**Science of High Fructose Corn Syrup**

1. **Cornstarch is made from corn**
2. In a manufacturing facility, enzymes turn the cornstarch into a sugar called glucose.
3. Another enzyme called glucose isomerase then turns that glucose into another sugar called fructose, making high fructose corn syrup.
Homemade Ice Cream
Half and half, whipping cream, sugar, flavoring

Grocery Store Ice Cream
Skim milk, cream, sugar, corn syrup, pasteurized egg yolks, whey, molasses, acacia gum, guar gum, ground vanilla beans, annatto color, natural flavors (with vanilla extract), carob bean gum, carrageenan, xanthan gum

THE SCIENCE OF ICE CREAM FREEZING

1. Water freezes at 0°C but ice cream freezes at -16°C. Sugars in the ice cream lower the freezing temperature of the mixture.

2. When the ice cream freezes, the milk and water in the mixture form ice crystals. The smaller the ice crystals, the smoother the ice cream.

3. Liquid nitrogen quickly freezes the ice cream. It helps make small ice crystals and very smooth ice cream.

MOST POPULAR FLAVORS in SCIENCE CLUB

Kids
- Chocolate: 27.7%
- Vanilla: 24.0%
- Cookies & Cream: 15.4%
- Other: 9.2%
- Mint Chocolate Chip: 4.6%
- Strawberry: 2.7%

Mentors
- Chocolate: 30.9%
- Cookies & Cream: 19.2%
- Butter Pecan: 15.4%
- Mint Chocolate Chip: 11.5%
- Other: 11.5%
- Vanilla: 11.5%

SCIENCE OF ICE CREAM VARIETIES

Dippin’ Dots
Frozen in liquid nitrogen

Soft Serve
Served at -4°C

Frozen Custard
Extra egg yolks add richness

Hard Serve
Served at -16°C

Frozen Yogurt
Contains yogurt

Freeze Dried
Water removed in a vacuum chamber
THE SCIENCE OF PANCAKES

INGREDIENTS

NATURAL
Enriched bleached flour, sugar, soy flour, canola or soybean oil, salt, buttermilk, guar gum

ARTIFICIAL
Dextrose, leavening, sodium stearoyl lactylate

SCIENCE OF MAKING PANCAKES

1. Flour, sugar, eggs, milk, and vegetable oil are combined in a bowl. As the batter is stirred, proteins from the flour begin to link together and form a mesh-like pattern. This “gluten network” gives structure to the pancakes.

2. Baking soda or baking powder are added to the batter. These leavening agents form CO₂ bubbles and help make the pancake fluffy. But don’t let the batter sit too long. The CO₂ bubbles will begin to escape from the batter and will not be available to make fluffy pancakes.

3. Cook the pancakes at approximately 375°F (190.6°C). Heat causes the CO₂ gas bubbles to expand. Heat also evaporates some of the water and strengthens the gluten network.

4. Cook until bubbles form on the surface of the pancake and the edges look dry. Flip the pancake. Cook a few more minutes. Enjoy!

SCIENCE OF LEAVENING

1. Flour mixed with water forms a gluten network.
2. Leavening agents, such as baking soda and baking powder, produce carbon dioxide bubbles when combined with water.
3. When added to batter, leavening agents create bubbles that get trapped in the gluten network. The bubbles lift the pancake and help make it fluffy.
**Flamin' Hot Cheetos**

**Natural:** enriched corn meal, vegetable oil, salt, sugar, yeast extract, sunflower oil, cheddar cheese, onion powder, whey, garlic powder, buttermilk, skim milk, cash

**Artificial:** maltodextrin, monosodium glutamate, citric acid, natural flavor, artificial color, partially hydrogenated soybean and cottonseed oil, whey protein concentrate, corn syrup solids, sodium diacetate, sodium caseinate, lactate, disodium inosinate, disodium guanylate

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**Sodium diacetate**
- Has a vinegar flavor

**Sodium caseinate**
- Has a milk flavor

**Lactic acid**
- Has a sour flavor

**Disodium inosinate**
- Has umami flavor

**Disodium guanylate**
- Has umami flavor

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**Emulsifiers**
- keep oil and water together

**Examples of emulsifiers** include:
- sodium citrate
- sodium phosphate
- soy lecithin
- sodium stearoyl lactylate

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**Transforming Agents**
- Change the appearance of a food

**Maltodextrin**
- Turns high-fat liquids into powders

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**SCIENCE OF FOOD ADDITIVES**

**Without emulsifier**
- Oil and water separate

**With emulsifier**
- Oil and water stay together