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Abstract

Our group aimed to research the various aspects of bread in a scientific context. We dove into the different types of bread, including multigrain bread and white bread. We compared the benefits and drawbacks of each type, looking from both a health standpoint and marketing standpoint. We found that overall, multigrain bread is healthier due to its higher fiber content and inclusions of pseudocereal. After researching the differing types, another important question arose: why some people with gluten intolerances can eat bread in other countries but not in America. Three main factors account for a difference in bread between countries: sodium content, wheat type/chemicals, and confounding variables. Finally, our group researched the history of bread making techniques and common processes used today, including the bulk fermentation process and chorleywood bread process (CBP).

Comparing Na Content

Bread Type	Average US Na Content (mg/100 g)	Average UK Na Content (mg/100 g)
Rye Bread	557	345
Bread Rolls	484	405
White Bread	471	421
Multigrain Bread	398	396

Source: Coyne, Kasey J, et al. "Differences in the Sodium Content of Bread Products in the USA and UK: Implications for Policy." (Table 1)

American vs European Bread

After our initial research, some of our peers noted that they are able to eat gluten and bread while vacationing in European countries, but unable to eat it in America. After further research, we found there were three key factors to explain this.

- Sodium Content:** In the United States, bread is one of the highest contributors to high sodium levels due to the use of salt for preservation and longer shelf life. On average, breads from America had 12% more Na when compared with similar bread products in the UK.
- Wheat type and Chemicals:** America primarily uses hard red wheat, which has a higher gluten content, as opposed to soft wheat primarily used in the UK. American food uses many added chemicals that are banned in the UK, including potassium bromate, red dye no. 40, and yellow dyes no. 5 and 6.
- Confounding Variables:** If you're vacationing in Europe, you likely eat more fresh foods and less processed items, causing better digestion of these foods on vacation. Additionally, stress is a main factor that disrupts gut health. A vacation is much less stressful than your day-to-day life, which can improve your digestion.



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White bread

- The earliest forms of white bread were found nearly 4,500 years ago in Ancient Egypt. Ancient Egyptians were the first to perfect the fermentation process, creating the nice, soft bread we have today
- White Bread was used to establish the rich from the poor. It was considered a **status symbol** to own white bread in those times.
- Unfortunately, white bread is considered **one of the unhealthiest forms of bread**.
- Positives: is **rich in nutrients and vitamins**, has a high glycemic index (good for short energy bursts), and could promote gut health (contains **levels of Lactobacillus**, a bacteria which prevents intestinal damage)
- Negatives: has a **lack of fiber and vitamin E**, high in carbohydrates and calories, can spike blood sugar levels, and can lead to an **increased risk of type 2 diabetes and heart disease**
- Forms of White Bread:
 - The traditional loaf = first developed in Ancient Egypt, nearly 12,000 years ago.
 - Focaccia = originated in Ancient Greece, with the exact year very unclear to historians.
 - Pretzel = first created in 610 AD by an Italian monk who was trying to make an unleavened bread for lent.
 - Cakes = were likely first made in Ancient Egypt around the 4th century B.C.

Multigrain Bread

- Multigrain bread is healthier because **pseudocereals** are used to develop and bake it.
- contain multiple healthy and beneficial components for the human body, including bioactive compounds, vitamins, minerals, and dietary fiber.
- Different sources of multigrain are:
 - Teff was first developed in the northern Ethiopian Highlands.
 - Quinoa originated in the Andes region about 700 years ago.
 - Buckwheat is an ancient pseudocereal originating out of seeds and green leaves from many countries.
 - Sorghum is an ancient crop from Africa, Asia, and India.
- Benefits:
 - Increases dietary fiber**, protein, and healthy fats, while also contributing to a **lower glycemic index**.
 - Purpose of fiber: Bowel health, weight management, blood sugar control, heart health, cancer risk reduction, gut health, and fat absorption.
 - Higher levels** of polyphenols, antioxidants, and essential minerals.
 - Teff flour-based bread has significantly **higher iron**, manganese, and other minerals compared to 100% wheat flour bread.
 - Multigrain Khakhra bread had significantly **higher total dietary fiber** than whole wheat bread.
- Challenging for bakers since there is an absence of gluten in most grains, the resulting bread is characterized by poor crumb and crust, and fast staling. The visual appearance of multiple grains is not as appealing as wheat bread.

Nutrition: White vs Multigrain

Nutrition Facts
10 servings per container
Serving size 2 Slices (57g/2.0oz)
Amount per serving
Calories 140

Total Fat 1.5g 3%
Saturated Fat 0g 0%
Trans Fat 0g
Polyunsaturated Fat 1g
Monounsaturated Fat 0g
Cholesterol 0mg 0%
Sodium 180mg 8%
Total Carbohydrate 29g 11%
Dietary Fiber 3g 10%
Total Sugars 5g
Includes 5g Added Sugars 11%

Protein 5g
Vitamin D 3.7mcg 20%
Calcium 480mg 35%
Iron 1.9mg 10%
Potassium 70mg 0%
Thiamin 0.46mg 40%
Riboflavin 0.19mg 15%
Niacin 2.6mg 15%
Folate 100mcg DFE (60mcg folic acid) 25%

Nutrition Facts
18 servings per container
Serving size 1 slice (32g)
Amount per serving
Calories 50

Total Fat 1.5g 3%
Saturated Fat 0g 0%
Trans Fat 0g
Cholesterol 0mg 0%
Sodium 150mg 7%
Total Carbohydrates 14g 5%
Dietary Fiber 8g 29%
Total Sugars 0g
Includes Added Sugars 0g 0%

Protein 2g
Vitamin D 0mcg 0%
Calcium 10mg 0%
Iron 0.4mg 2%
Potassium 40mg 0%

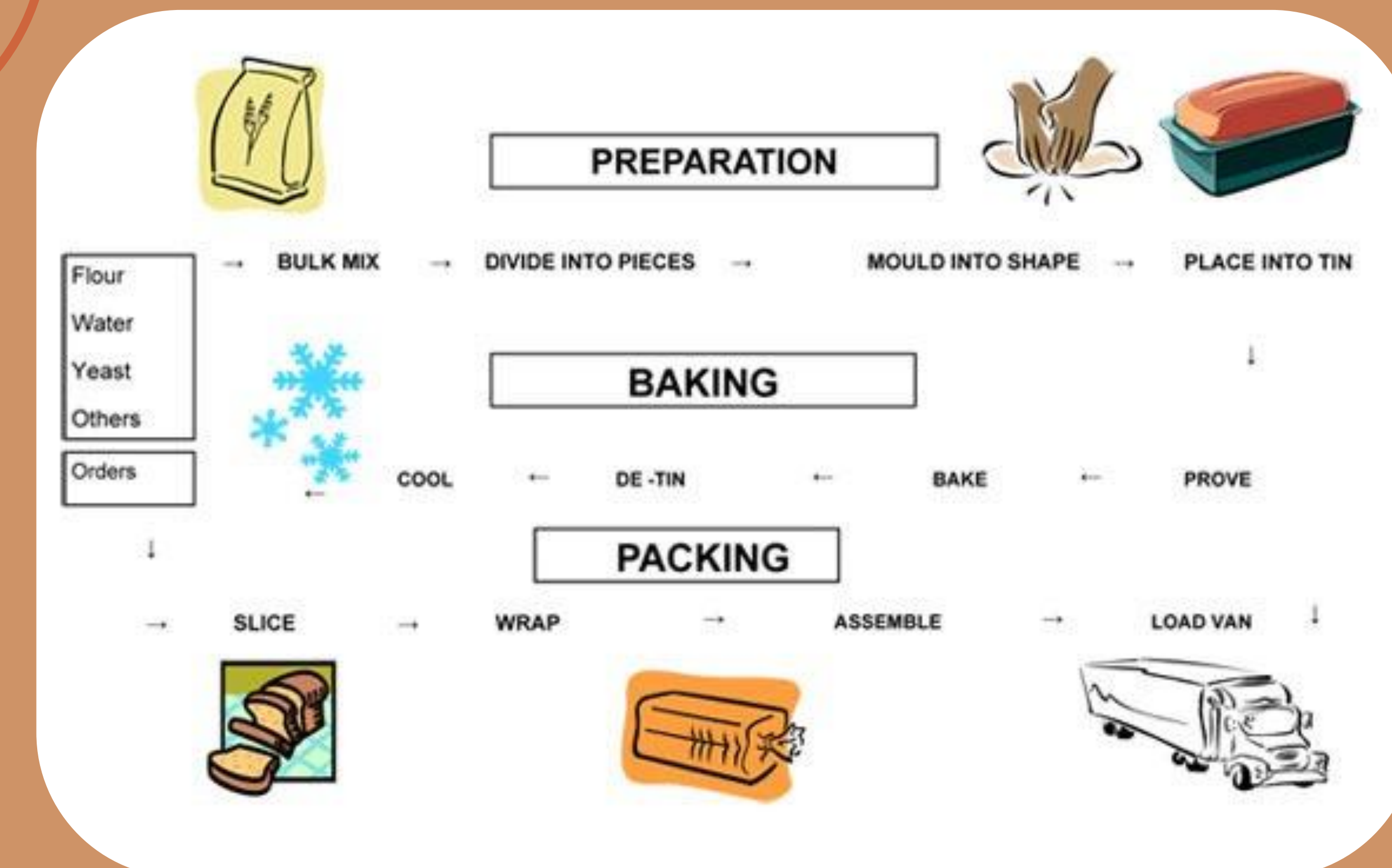
Bread Making Techniques

Bulk Fermentation Process

- Traditional way to bake bread that many families use to make **homemade bread**
- Ingredients are mixed together into a dough
 - left to ferment for up to 3 hours
- The fermentation process changes the dough from a short dense mass to an elastic dough, **creates carbon dioxide** which makes the bread **light and fluffy**, which gives a better overall final product
- Time is different with each dough because it is dependent on the amount of yeast used and the dough temp

Chorleywood Bread Process (CBP)

- Used in **large scale commercial bakeries**
- Developed in 1961 by Bill Collins, George Elton, and Norman Chamberlain
- Invented in Britain to make bread loafs softer and cheaper so the everyday peasant can afford a loaf of bread
- High speed mixing** to develop the dough for proving and baking
- Does not need the fermentation step as the rapid kneading helps develop the gluten
- Needs a flour treatment agent like **ascorbic acid and a little fat** to improve the quality of the bread
- All the other steps are the same for the rest of the process.



Conclusion

The development of bread has evolved through the years resulting in major changes. Different tweaks in recipes result in different outcomes of bread, whether it is changing the flour, the type of yeast, or even adding different aspects. Bread is a connecting factor of many communities and cultures, it brings together many different family through rituals of breaking bread. The effects of bread on the body concurrent with the ingredients, as bread provides fiber, vitamins, minerals, and source of energy.

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