

Potential Hazards Associated with Fermented Foods

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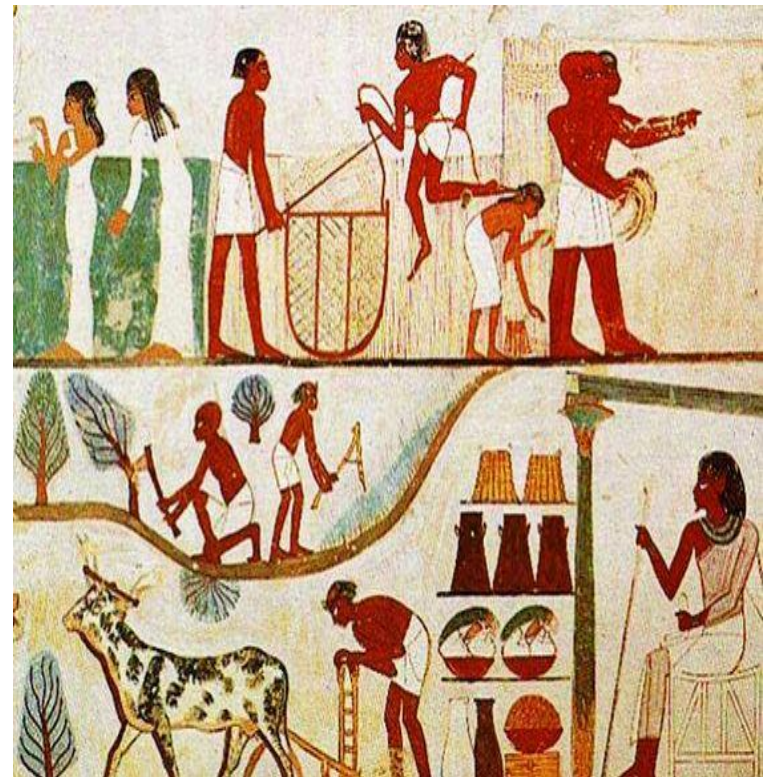
and

Chef Tyler Henderson, Jackson & Co.
Catering



Fermentation as a Food Trend

- What's old is new again...
- Fermentation has long been a part of human history dating back at least 9000 years.
- This played a vital role in human survival before stoves and refrigeration.



Fermented Foods

- Cheese
- Sauerkraut
- Olives
- Salami
- Jerky
- Bread
- Beer
- Wine
- Hot Chocolate



Food Poisoning

- Scientific literature has never recorded a case a food poisoning involving raw vegetables that have been fermented properly.

PROPERLY!



Source: http://www.naturalnews.com/food_poisoning.html

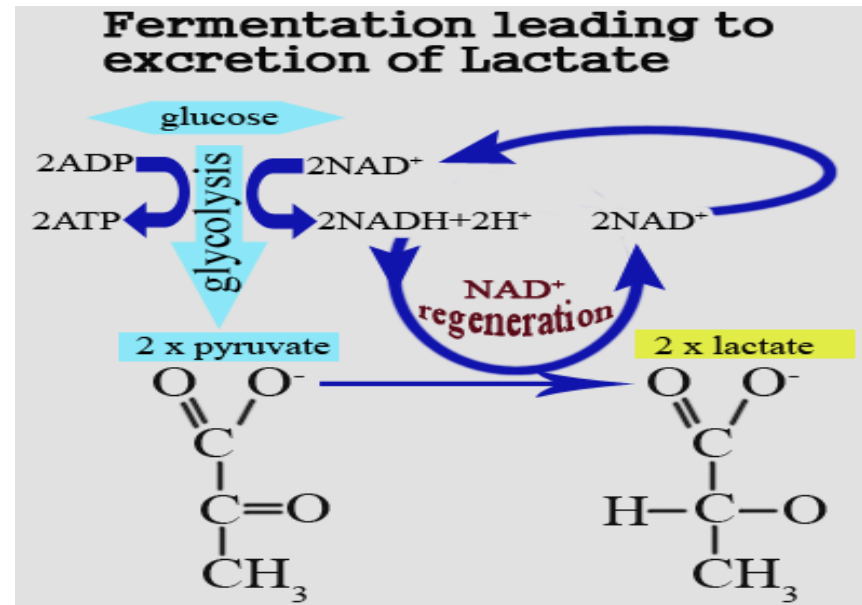
How does it work?

- Fermentation happens when the natural bacteria in the vegetables breaks down the components into forms easier to digest and sometimes more nutritious than raw vegetables.
- Some consider fermented vegetables safer than raw products because of the lactic acid produced killing any pathogens.

Fermentation

- More specifically, chemical changes are brought about in an organic substrate through the action of enzymes elaborated by microorganisms.
- Fermentation is a metabolic process in which an organism converts a carbohydrate such as starch and sugar into alcohol and/or acid.

What is Fermentation?



Lactic Acid Bacteria

- *Carnobacterium*
- *Enterococcus*
- *Lactococcus*
- *Lactobacillus*
- *Lactosphaera*
- *Leuconostoc*
- *Oenococcus*
- *Pediococcus*
- *Streptococcus*
- *Tetragenococcus*
- *Vagococcus*
- *Weissella*

Pickling and Fermenting are *Not* the Same Thing

- “Overlapping” categories
- A cucumber can be pickled with vinegar or fermented without vinegar using a salty brine instead.
- During fermentation, vinegar and other acids are produced giving fermented sauerkraut and pickles a vinegary taste.

Fermentation vs Pickling

Preserving Liquid

Brine → Lactic Acid

Vinegar

Environment

Clean

Sterile

Probiotic (alive)



Encourages Good Bacteria



Kills All Pathogens

Adds Nutrients



Speed

Slow

Fast

Flavor

Complex

One-Note

Shelf Stable



Worldwide

- Kimchee – Korea
- Sauerkraut – Germany
- Turnips – Turkey
- Olives – Spanish, Greek, Sicilian
- Tempeh – Indonesia
- Miso – Japan
- Ogi – Nigeria
- Gari – Western Africa



What About Food Safety?

- Basic food safety practices MUST be followed.
 - Vegetables grown using Good Agricultural Practices (GAP)
 - Washing produce
 - Hand washing
 - Cutting or preparation utensils
 - Food contact surfaces
 - Food containers



Food Safety

- The biggest concern with fermented vegetables is contamination AFTER the foods have been fermented.
- Handling them with unclean hands
- Letting them come into contact with contaminated proteins (meat or fish)
- Surfaces that have not been cleaned properly



Lactic Acid

- The *potential* of lactic acid fermentation to control the harmful effects of food contamination depends on multiple factors which most kitchen employees are not able to quantify:
 - Initial bacterial load of lactic acid bacteria
 - Initial level of contamination
 - Hygiene and sanitation
 - Resulting degree of acidity

Fermentation

- On its own, fermentation cannot eliminate all food-related health risks.
- It should **not** be seen as a replacement for observing food hygiene principles.

Temperature

- 70-75°F – kraut will ferment in 3-4 weeks
- 60-65°F – kraut will take 5-6 weeks
- Below 60°F, kraut may not ferment
- Proper fermentation temperature may allow the destruction of potential pathogens as well as inhibit spoilage bacteria.

Salt

- Salt is an essential ingredient but most chefs do not have a method to measure salt content so recipes must be tested.
- Must use canning or pickling salt not just for clarity but for concentration.
- Salt with iodine should not be used since iodine can inhibit fermentation.

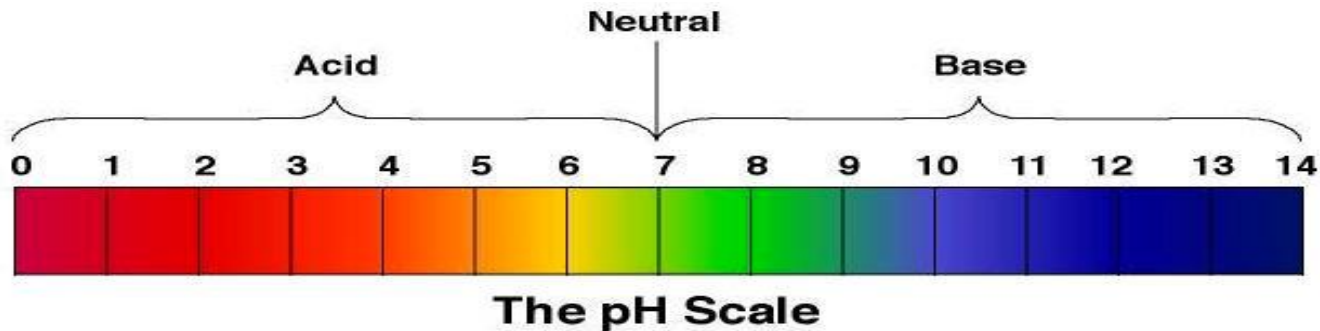


Storage Time

- Storage time affects the texture.
- The shorter the time, the firmer the vegetables.

pH

- Fermented foods need a pH level of 4.2 or lower indicating that it is acidic enough to be safe and non-TCS.

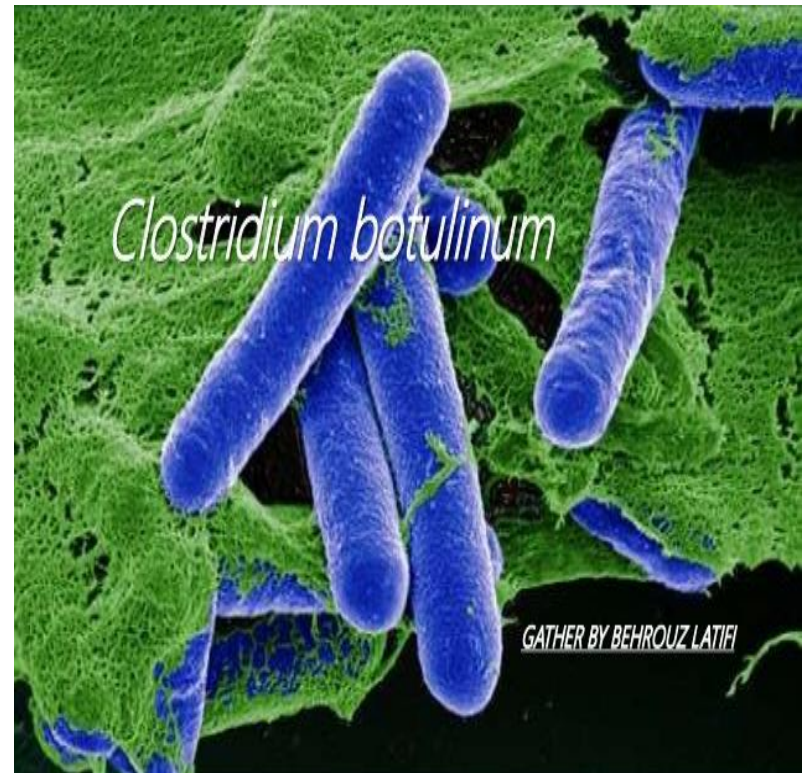


Pathogens Associated with Fermented Foods

- Harmful Pathogenic microorganisms may still survive
- Parasites, bacteria, fungi and some virus are components of fermented fruits/veggies

Botulism

- 263 cases from 1990 – 2000
 - Majority from Alaska associated with traditional Alaska native foods
 - 2002 beached beluga whale
- 2012 New York *C. bot* in fermented tofu
 - People who fell ill bought from the store's bulk tofu which had been kept unrefrigerated, uncovered, and in water-filled bins



Staphylococcus aureus

- Similar to *C. bot*, the fermentation process can reduce or destroy live bacteria, however, if allowed to produce toxins, the toxins cannot be destroyed.



Vegetable Size

- Grate, chop or shred vegetables because vegetables such as carrots or beets are dense and it is difficult for the lactic acid to penetrate
 - this is a quality issue because it is difficult for pathogens to enter the vascular system of the plant (leafy greens are different)
 - Because cucumbers are about 90% water, the lactic acid can penetrate easily

Kimchi

- Staple of Korean cuisine
- Usually served as a side dish
- Traditionally stored underground in clay pots to keep cool and unfrozen in the winter months
- Kimchi refrigerators are now used

Kimchi

- ▣ Individual ingredients were sampled to identify the source of Lactic acid bacteria in Kimchi
 - ▣ Radish
 - ▣ Ginger
 - ▣ Napa Cabbage
 - ▣ Peppers
 - ▣ Garlic*







Tempeh

- Tempeh is a traditional soy product originating from Indonesia.
- Like tofu, tempeh is made from soybeans, but it is a whole soybean product with different nutritional characteristics and textural qualities.
- Tempeh's fermentation process and its retention of the whole bean give it a higher content of protein, dietary fiber, and vitamins.
- It has a firm texture and an earthy flavor, which becomes more pronounced as it ages.



Tempeh and Outbreaks

- 2012, 89 cases of *Salmonella enterica* in North Carolina
 - 10 food service workers
 - 2 health care providers
 - 39 university students
- 3 restaurants using unpasteurized tempeh
- Multiple opportunities for cross contamination
- Smiling Hara identified as producer which distributed to 36 restaurants

Kombucha

- Kombucha is a naturally carbonated, fermented tea.
- Its made by fermenting tea and sugar and a mother culture also known as a Symbiotic Culture of Bacteria and Yeast (aka SKOBY)
 - It's a biofilm
- Many claim health benefits, but its benefits or adverse effects have not been determined scientifically.





Kombucha

- If prepared correctly, it should have a pH between 2.5 and 3.5, but it takes 5-10 days to lower the pH
- Most recommend adding concentrated Kombucha or distilled white vinegar as the started liquid

Kombucha Risks

- ▣ Risks for mold compromise to the SKOBY
- ▣ Equipment issues
- ▣ Ingredient Risks
- ▣ Poor Sanitation
- ▣ Pest Risks – especially ants, fruit flies and vinegar nematodes

Vinegar Nematodes

- Enjoy the low pH
- Not harmful but most people do not like drinking tea with swimmy things in it.
- Colonize the SKOBY – everything must be thrown out.



Kombucha Risks

- Over consumption:

- Fatigue
- Diarrhea
- Muscle Cramps
- Headaches
- Anxiety
- Sinus Problems
- Skin Rashes

THANK YOU!

■ Questions?