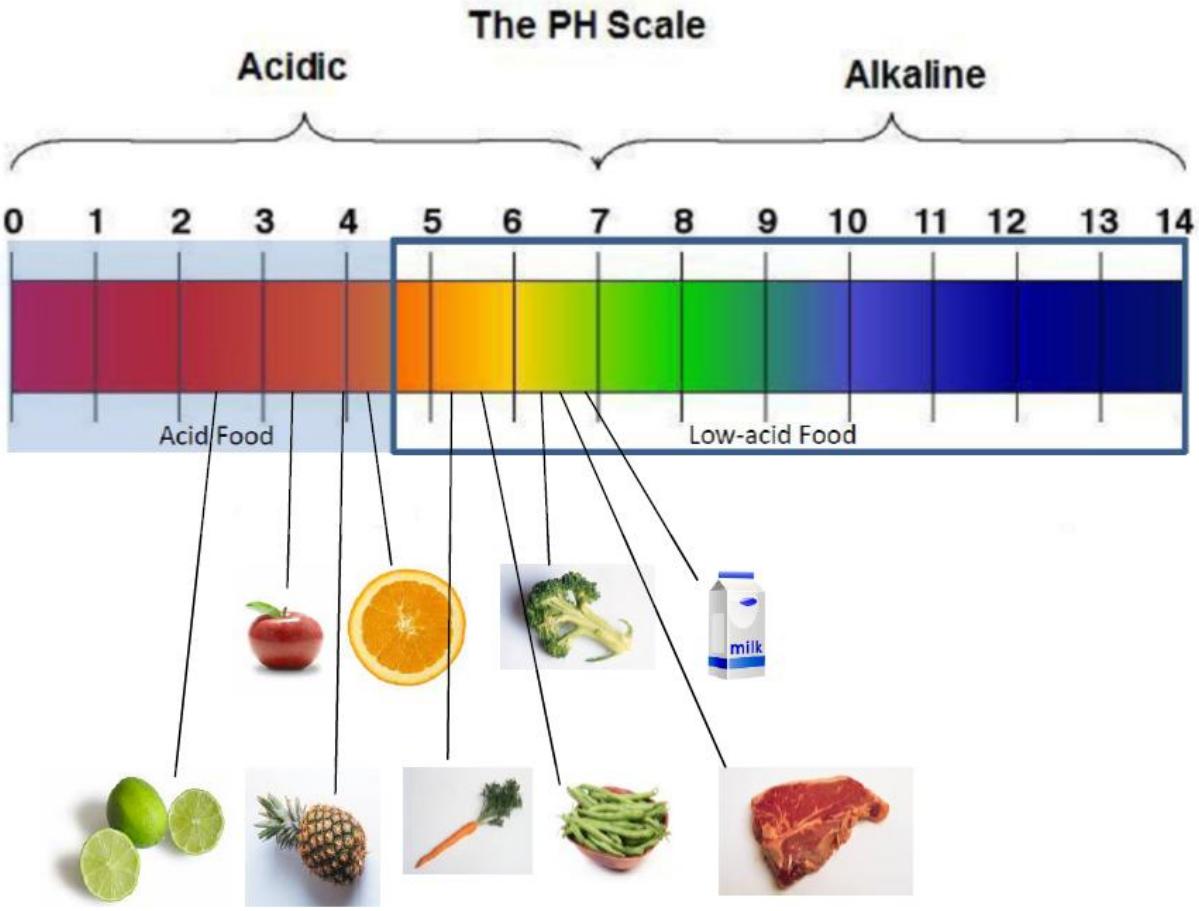
Food Entrepreneurs Series: Science Basics

Understanding the pH of Your Food

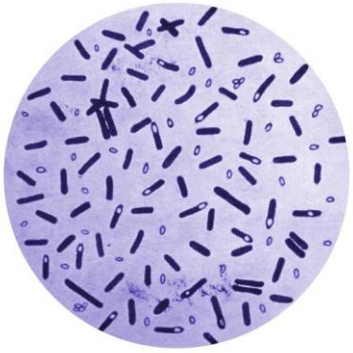
The term pH refers to the acidity of a product. Much like there is a scale to measure heat (temperature), there is also a scale to measure acidity in food. The pH scale ranges from 0 to 14. A value of 7 is assigned when a product is neutral. Any values below 7 are considered acidic, while values larger than 7 are basic (or alkaline).

In scientific terms, the pH scale actually measures the concentration of positively-charged hydrogen ions [H+] and negatively-charged hydroxyl ions [-OH] that are present in a sample. When the concentration of hydrogen ions increases, so does the acidity. pH is measured using a logarithmic scale, meaning that each change in a whole number represents a tenfold change in [H+] concentration. For example, a sample with a pH of 3.0 has ten times the concentration of [H+] ions as a sample with a pH of 4.0, and a one-hundred times the concentration of [H+] than a sample with a pH of 5.0. Therefore, small changes in pH measurements actually represent large changes in [H+] concentration (and therefore, acidity). For this reason, it is important to get accurate pH readings of any food product tested.



In general, the pH of a product will determine which microorganisms are capable of growing in it. Most microorganisms are able to survive and grow in pH environments between 4.6 and 9. Most food items are naturally acidic, meaning their pH values are less than 7. As the pH values decrease (become more acidic), the microorganisms have a more difficult time surviving and growing. Therefore, the acidity of a food product is often used as a means of preservation and a way to keep food safe for consumption.

There is one important pH value to know in regards to food safety, and that value is **pH 4.6**. At a pH of **4.6**, *Clostridium botulinum*, the spore-forming bacteria that causes the deadly disease botulism, is prevented from growing and forming deadly toxin.



Microscopic view of *Clostridium botulinum* and the spores it produces

The pH value **4.6** is used to place foods into different categories based on their food safety risks:

- When a food item is comprised **solely or mainly of ingredients with a pH of 4.6 or lower**, we refer to those food items as an **acid food**. Acid foods include apples, oranges, and lemons.

  Acid or Acid food + Acid or Acid food = Acid food (pH naturally ≤ 4.6)

- When the pH of a food item is **greater than 4.6**, that food is referred to as a **low-acid food***. Low acid foods include most vegetables and meats.

  Low acid food + Acid, Acid food, or Low Acid food = pH > 4.6 = Low acid food

- When food items **contain some ingredients whose pH is greater than 4.6, but the overall pH of the food is 4.6 or less**, that food item is called an **acidified food**. Acidified foods have a pH of 4.6 or less due to the addition of acid or acid foods to low acid ingredients. Examples of acidified foods are "pickled" products such as pickled beets, cocktail onions, and cherry peppers.

  Low acid food + Acid or Acid food = pH ≤ 4.6 = Acidified food

*Note: Low acid foods contain lower amounts of acid, and have higher pH values.