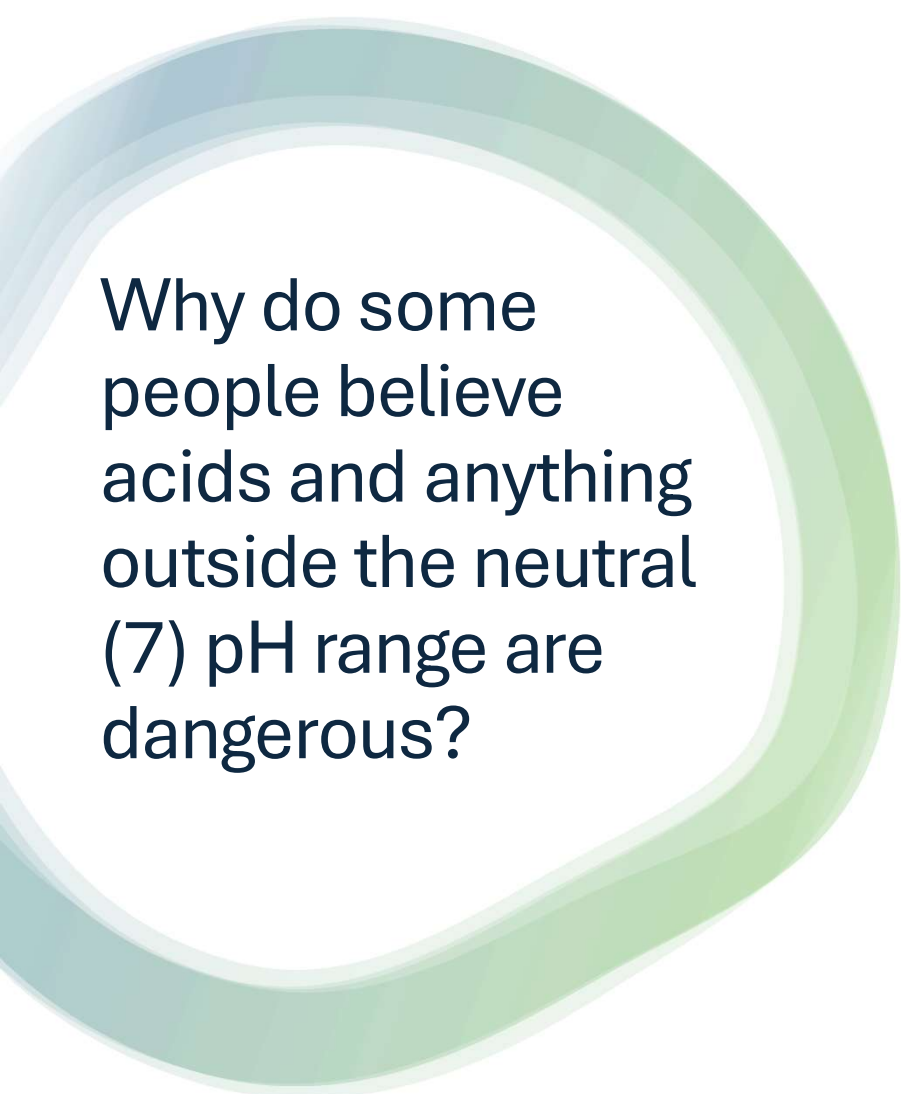




All acids are harmful and consuming anything outside of the neutral pH range is dangerous

Challenging common misconceptions in science



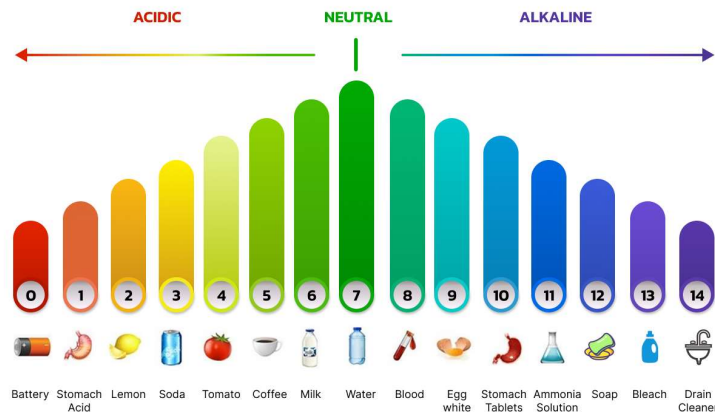
Why do some people believe acids and anything outside the neutral (7) pH range are dangerous?

Some people believe that all acids or anything outside of the neutral range is harmful because they were taught about pH in an oversimplified manner. In common speech, acid means any strong dangerous corrosive chemical but in scientific literature, acid means anything left of 7 on the pH scale and bases, anything to the right of 7 (pH 2025). The power of acids is usually exaggerated or lumped together as all acids are strong and taught to children at a young age because it is easier to explain only the extremes of the pH scale than everything in between. A certain kid's science youtuber even has a video about "Acid vs Lava: which is more destructive?". As a young child, it wouldn't be hard to assume that if a scientist in a lab coat tells you acid is as strong as lava, you could assume all acid is bad and dangerous, and the majority of people blindly cling to what they learned as a child because they have no reason to question it.

Evidence check:

The United States Environmental Protection Agency states that “Acidic and alkaline (basic) are two extremes that describe substances ... just like hot and cold are two extremes that describe temperature,” (pH 2025). We know that there is a large range between hot and cold and there is a similarly large range between strong acids and bases. We also know that some hot and cold things can be useful and be safe to use, like ice cubes or hot coffee and some require protective equipment, the same is true about pH. In simple terms, acidity is measured by the number of hydrogen ions - positive charges – present in a substance when in water. The more hydrogen ions, the more acidic something is, the fewer there are, the less acidic it is (Wolfe 2022). Strong acids can be dangerous because they contain a high concentration of hydrogen ions which, when exposed to water react, producing heat and creating something called *hydronium* (Lower & Kahlon, 2023). Hydronium is safe in low concentrations but, high concentrations when paired with heat from the reaction can lead to burns and organ damage.

Figure 1. pH scale with examples



Note. From, pH scale [illustration] by, Stanford Advanced Materials, 2025

Corrected explanation:

The claim that all acids and substances outside of the neutral range are harmful is misleading because it is oversimplified and exaggerated. Substances outside of the neutral pH range are not inherently harmful as many foods and drinks reside between 2 and 9 on the pH scale such as lemons or baking soda. The danger of ingesting acids and bases comes when they are out of the 2-9 range, when super concentrated or when other harmful chemicals are present in the substance.

See for your self: Don't take my word for it, see it your self. All you need is a red cabbage, a pot and some water. Take a red cabbage, chop it up finely and boil it in a pot of water. Simmer for several minutes. Strain out the cabbage and you have a natural indicator. Test it on various household items. Mixing it with an acid makes the juice pink and mixing it with a base makes the juice blue, purple is neutral.

Myth	Reality	Why it matters
All acids are dangerous	Not all acids are dangerous	Many items classified as acids or weak acids are completely safe and used or consumed in daily life for example, lemons
All acids are corrosive	Not all acids are corrosive	Typically, only highly concentrated or strong acids are corrosive to skin or metal
Anything outside the neutral pH range is harmful	Many substances outside of the neutral range are not harmful	pH is not the only factor if something is harmful, concentration and added chemicals play a large role in the safety of a substance

Community Strategy:

If you encounter someone that believes this claim, tread gently, try saying “You know, I’ve never heard that before, could you explain it to me? Because now, they feel heard, but you also have the opportunity to share what you know about the topic, aka what is true.

Learning use:

This resource can be used as a discussion starter in any high school or university science class about pH, acids and bases and why they aren't all harmful or, as a discussion about somethings students accept as fact without doing research of their own. You could have students brainstorm and discuss other topics that they accepted without questioning it



Note. Soren Sorensen, the man who discovered pH.

SDG 4 Connection:

This micro-assignment supports quality education because it encourages the reader to question what they think they know about a topic. It challenges readers to evaluate where their information is coming from and if the information seems complete, if it has been over simplified or, if it has been exaggerated.

References:

- 1) *What is pH?*. United States Environmental Protection Agency. (2025, November 4). <https://www.epa.gov/goldkingmine/what-ph>
- 2) Wolfe, S. L. (2022). *Acids and Bases*. EBSCO. <https://www.ebsco.com/research-starters/chemistry/acids-and-bases/>
- 3) Lower, S., & Kahlon, A. (2023). *The Hydronium Ion*. LibreText Chemistry. [https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_\(Physical_and_Theoretical_Chemistry\)/Acids_and_Bases/Acids_and_Bases_in_Aqueous_Solutions/The_Hydronium_Ion](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Acids_and_Bases/Acids_and_Bases_in_Aqueous_Solutions/The_Hydronium_Ion)
- 4) Trento, C. (2025). *pH scale with examples*. Stanford Advanced Materials. Retrieved September 24, 2026, from <https://www.samaterials.com/ph-acids-bases-and-common-materials.html>.
- 5) Leroux, H. (2018). *Soren Sorensen drawing*. NDTV Worlds. Retrieved September 24, 2026, from <https://www.ndtv.com/world-news/google-doodle-spl-sorensen-honoured-by-google-for-creating-the-ph-scale-1859019>

I consent to sharing this resource publicly under a CC BY-NC-SA license.