

Mixing Bleach and Vinegar – Here's What Happens

This entry was posted on [December 1, 2020](#) by [Anne Helmenstine](#) (updated on [December 1, 2020](#))



When you mix bleach and vinegar, the bleach reacts with acetic acid in vinegar to produce toxic chlorine gas.

Mixing bleach and vinegar is not safe. Bleach reacts with the acetic acid in vinegar to produce toxic [chlorine gas](#). Chlorine is a yellowish-green gas that attacks mucous membranes and the respiratory system and can be potentially fatal.

Why People Mix Bleach and Vinegar

Most of the time, mixing bleach and vinegar is accidental. It can happen if you use multiple cleaning products or aren't careful to rinse after using one or the other.

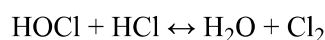
However, some people intentionally add vinegar to bleach to make it more acidic so it's a stronger disinfectant. The risk outweighs the benefit, though, because the increased potency isn't significant enough to offset the danger of exposure to chlorine gas.

What Happens When Bleach and Vinegar Are Mixed

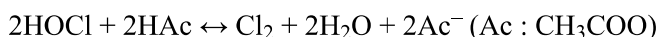
Chlorine bleach contains sodium hypochlorite (NaOCl), but because it's dissolved in water, the chemical exists as hypochlorous acid (HOCl):



Hypochlorous acid is so good at bleaching and disinfecting because it's a strong oxidizer. This also makes it good at participating in undesirable chemical reactions. Mixing bleach with an acid produces chlorine gas. For example, reacting bleach with hydrochloric acid makes water and chlorine:



Vinegar contains diluted acetic acid rather than hydrochloric reaction, but chlorine is still produced:



An equilibrium exists between the different chlorine-containing species. At low pH (which you get when adding vinegar or toilet bowl cleaner), the reaction favors the production of chlorine gas. In contrast, increasing the pH favors the conversion of chlorine gas into the hypochlorite ion. Hypochlorite is not as good an oxidizer as hypochlorous acid, which is why some people intentionally lower the pH of their bleach.

What to Do If You Mix Bleach and Vinegar

You'll know there's a problem if the liquid suddenly smells very strongly of bleach (which is really the odor of chlorine). If you see a faint yellowish-green haze, it's a sign of significant chlorine gas production. But, both bleach and vinegar are dilute, so generally the gas is invisible. Avoid breathing the vapor and immediately leave the area. Return only after the chlorine odor has dissipated. Immediately seek medical attention or call Poison Control if you experience burning or blistering eyes, skin, or mucous membranes or have trouble breathing.

Properly Using Bleach and Vinegar

It's fine to use both vinegar and bleach to clean and disinfect, providing you thoroughly rinse the surface with water before switching products. Instead of adding vinegar to bleach water to increase its effectiveness, just buy a fresh bottle of bleach. Bleach loses its activity over time, so a new bottle is stronger than one that has been stored for several months.

Bleach and Other Chemicals

Vinegar isn't the only chemical that produces a nasty reaction when mixed with bleach. Mixing bleach with any acid, alcohol, peroxide, or ammonia releases toxic fumes. [Bleach mixed with ammonia](#) makes chloramine gas, which can cause chest pain and shortness of breath. [Bleach and alcohol make chloroform](#), which is a central nervous system depressant that could cause unconsciousness and respiratory failure. Bleach with peroxide forms irritating and corrosive peracetic acid.

References

- Bodkins, Bailey (1995). *Bleach*. Philadelphia: Virginia Printing Press.
- Slaughter, R. J.; Watts, M.; Vale, J. A.; Grieve, J. R.; Schep, L. J. (2019). "The clinical toxicology of sodium hypochlorite". *Clinical Toxicology*. **57** (5): 303–311. doi:[10.1080/15563650.2018.1543889](https://doi.org/10.1080/15563650.2018.1543889)
- Washington State Department of Health. [Dangers of Mixing Bleach With Cleaners](#).