## How acidic is your stomach?

Jonathan Ebel

Steam project

Anatomy and physiology

Objective 53: Know the tissues/ cells and functions of the following: stomach, pancreas, liver, gallbladder, large intestine,

The stomach is part of the digestive system and is tasked with the job of breaking down and digesting the majority of the food you ingest. It accomplishes this by a number of built-in processes. Starting off the stomach has strong muscles that can contract in a way to break apart and smoosh the food inside. The stomach also has stomach acid or more specifically HCl or Hydrochloric acid that is uses to break apart and digest stuff.

This acid has a pH that ranges from 1 to 4 on the pH scale depending on if it is close to a meal according to springerlink.com. This is so strong that if it comes into contact with metal, it will eat right through it. The stomach acid is used to break apart the food and do most of the digestion needed. But there is a point at which the stomach acid is not strong enough to digest or break apart something. This has been studied a good deal as to why some things are digested while others are not. For example, if you were to swallow a marble it would come out whole. A more common display of this is with corn kernels or some seeds. There are somethings that just don’t get digested on their way through. But the stomach acid is so strong that there are very few of these exceptions to the complete decomposition.

The stomach has several different layers of smooth muscle surrounding it. Since they are made of smooth muscle they are not voluntarily controlled. The outermost level is the Longitudinal layer, the next one down is the Circular layer, and the deepest muscle layer is the Oblique layer. These muscles contract together in a churning motion to break apart the food.

The stomach lining has special cells that secrete mucous inside the stomach to create a protective layer against the acid according to Scientific American. If the acid came into direct contact with the tissues, it could cause an ulcer and be extremely painful. When the acid itself is created it is made in parts, and when these parts are released and mix, they form the active stomach acid.

The stomach acid also acts as a line of defense against bacteria and pathogens entering the body through the mouth. There are a wide variety of invaders that the stomach has to deal with, varying from worms and parasites to common bacteria. The majority of these are dissolved instantly in the acidic environment. But some are able to make it through, the majority of these are acid resistant and are therefore not as affected according to an article from the American society for microbiology.

The stomach is also closed off to the rest of the digestive system by the pyloric sphincter on the bottom and the lower esophageal sphincter on the top. These remain closed except for brief moments to let food in and out of the stomach. If the stomach acid were to come into contact with any other tissue outside of the stomach it would start digesting that tissue and could cause big problems.

## Sources

Cotter, Paul D. and Hill, Colin. “Surviving the Acid Test: Responses of Gram-Positive Bacteria to Low pH.” Microbiology and Molecular Biology Reviews, American Society for Microbiology, 10/11/2003, <https://mmbr.asm.org/content/67/3/429.full>

Purves, William K. “Why don’t our digestive acids corrode our stomach linings?” Scientific American, Scientific American, 11/13/2001, <https://www.scientificamerican.com/article/why-dont-our-digestive-ac/>

Simonian, H.P., Vo, L., Doma, S. *et al.* “Regional Postprandial Differences in pH Within the Stomach and Gastroesophageal Junction.” *Springer Link, Springer Nature 12/2005* <https://doi.org/10.1007/s10620-005-3048-0>