Gastro-tastic; Using Stomach Acid To Power Smart Pills

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Heard of using lemons, potatoes, or saltwater to create a simple battery? Stomach acid (dilute hydrochloric acid) can be used in the same way and is significantly more powerful. I use an array of zinc and copper strips immersed in stomach acid to turn a stomach into a galvanic cell battery. Doctors are already using smart pills to save lives. Many more are being developed. High-density batteries, especially lithium batteries, tend to be fairly toxic; the common Alkaline battery uses sulfuric acid, along with zinc and manganese, to generate electricity. The concentration of hydrochloric acid (HCl) in stomach acid (gastric fluid) is about 0.16M. It can be used to create a battery the same way sulfuric acid is used in alkaline batteries. The smart pill I'm building is about developing a technology that will make other smart pills more effective. My goal is to monitor the voltage and maximum current produced after it is swallowed and send data to an app over Bluetooth. As the project progressed, I also tested Magnesium-Copper galvanic cells. To do this, I designed two different sets of galvanic cells; testing Magnesium-Copper (Mg-Cu) and Zinc-Copper (Zn-Cu) galvanic cells in a 0.16M solution of Hydrochloric acid (HCL). This solution of HCL approximately matches the PH and HCL concentration in the human stomach. The Mg-Cu cell initially produces a voltage of 1.46V, however, the surfaces of the Mg strips rapidly corrode, and the voltage plateaus at 1.28V after one minute. During the Zn-Cu test, the electric potential drops to about 0.5V. Overall my design hypothesis was incorrect, but my material hypothesis was. The design had to be tweaked (and still will need to be) but the zinc-copper turned out to be the most efficient material used.

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