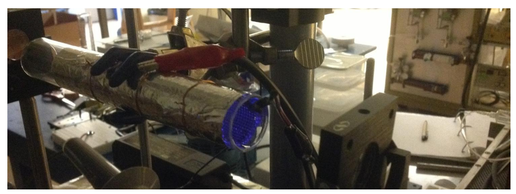
Ambient-Gas Plasma:
A Sustainable Disinfectant Made From Electricity and Air

Matthew J. Pavlovich and Connor J. Galleher
Department of Chemical and Biomolecular Engineering, University of California, Berkeley
Contact: mattpavlovich@berkeley.edu or connorgalleher@berkeley.edu
http://graves-lab.cchem.berkeley.edu/agp/

What is Plasma?

Sometimes called the “fourth phase of matter,” plasma is a high-energy state similar to gas. We create plasma from air at atmospheric pressure and room temperature, which produces reactive compounds that are toxic to bacteria and other microorganisms.

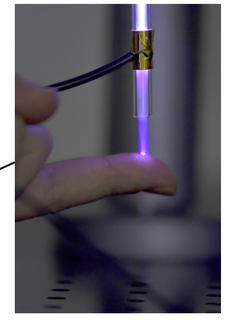
Designing a Prototype



Plasma disinfection works well in controlled lab conditions, but our current challenge is to translate our lab technology into a field-ready prototype. The prototype will be built out of cheap, robust materials that can be replaced locally. Plasma sterilization is well suited to low-resource settings because it requires only electricity and air to run.

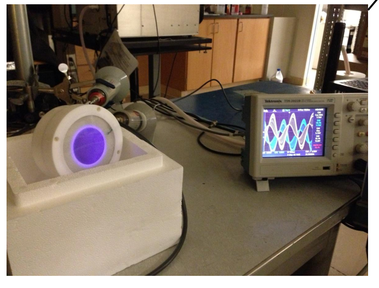
Potential Applications for the Developing World

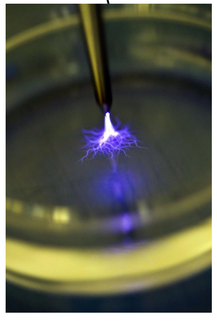
Solar Suitcase
Our collaborators at WE CARE Solar have developed a portable energy source to provide lighting, communication, and medical support in low-resource areas. Excess solar energy can be used to power plasma-producing devices.



Hand Hygiene
Hand washing is critical to preventing infections. Plasma can aid in skin antisepsis via direct surface disinfection or by creating antimicrobial water.

Surface Disinfection
Plasma disinfects surfaces, including instruments, textiles, food, and medical devices contaminated with bacteria and other pathogens.





Water Treatment
A major concern in the developing world is clean water for drinking and washing. Plasma can disinfect water in two different “modes,” either creating a persistent antimicrobial effect with nitrogen oxides, or using ozone for rapid decontamination.