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## Plasmas have healing powers

Nov 26, 2009 [5 comments](#)

Please disinfect your hands here

Two related studies have demonstrated the effectiveness of low-temperature plasma for killing drug-resistant bacteria on human skin – one of the biggest challenges facing modern medicine. In one study, researchers in Germany describe a device that can disinfect hands in seconds, while in the other they reveal how low-temperature plasmas can safely disinfect open wounds.

Bacterial infection is a serious problem in hospitals. Studies show that the infamous superbug methicillin-resistant *Staphylococcus Aureus* (MRSA) alone infects 100,000 people every year in the US and results in about 18,000 deaths.

The best way to tackle the problem is disinfectant, but this can be laborious. Every day hospital staff must disinfect their hands on dozens of occasions, each taking up to several minutes. Keeping open wounds free from bacteria can be even harder.

### Cool plasmas

In recent years, scientists have begun to investigate how plasmas – gases of ions and free electrons – can help. A fully ionized plasma can have a temperature in the region of 100,000°, which is far too hot for human tissue, but the temperature can be reduced if the degree of ionization is much lower, at say one part in a billion.

Gregor Morfill and colleagues at the Max-Planck Institute for Extraterrestrial Physics in Garching have shown how low-temperature plasmas can be used to clean hands conveniently in seconds. Their device contains a slab of dielectric material sandwiched between a solid electrode and a sheet of wire mesh. When they put a large voltage of 18 kV across the solid electrode and mesh, the resultant strong electric field generates numerous nano- and microsecond discharges that partially ionize the air. This ionization leaves ultraviolet radiation and a cocktail of chemical products – including ozone, nitrogen oxide, hydrogen peroxide and free radicals – which together kill bacteria.

Morfill told *physicsworld.com* that hospital staff could use the device routinely to clean hands and, if so

**"It will even  
sterilize your**

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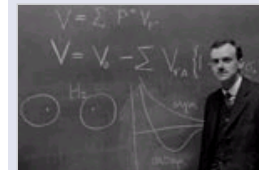
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desired, feet. "It will even sterilize your socks, although you should probably wash them too," he adds.

With other colleagues at the Max-Planck Institute, Morfill has examined the best way to use low-temperature plasma for cleaning open wounds. In some ways this is more difficult because ideally the plasma would not only kill bacteria but also prevent further growth of bacteria without having any negative side-effects on the living human cells.

socks, although you should probably wash them too"

**Gregor Morfill, Max-Planck Institute for Extraterrestrial Physics**

## Chemicals and plasma

The researchers performed a series of tests in which they subjected *E. coli* bacteria to both the chemical and UV products of plasma and, by shielding the bacteria with a quartz disc, just the UV products. They found that the UV radiation tended to kill bacteria in the short term, whereas the chemical products cause a lasting "after irradiation" inhibition of bacterial growth. With this knowledge, the researchers could determine the right composition and dosage of plasmas for future devices.

One of the group members, Tetyana Nosenko, said that the next step is to optimize the plasma composition for different types of wound, such as diabetic ulcers or those containing blood.

The research is described in two papers in the *New Journal of Physics*.

### About the author

Jon Cartwright is a freelance journalist based in Bristol, UK

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## 5 comments

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1 **introspector**  
Nov 26, 2009 7:34 PM

This appears to be effective, yet VERY cancerous. As in the past, x-rays and other uses of radiation, has shown to cause cancer. I do not know much about this new invention, but i will say that I fear for who may use that machine often. Hopefully, the new machine is kept under control.

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2 **inthend9**  
Nov 27, 2009 4:58 AM  
United States

**Effects and Bacterial Resistance**

In regards to the above comment, it seems that it would not be the ions that would cause cancer - that might give a skin burn at worst - but the magnetic field. We already have cell phones and microwaves that do the same, but magnitude is the question.

For the researchers, I ask what effectiveness does this have against bacteria / viruses? It sounds as if it would be strong, but killing 100% bacteria instead of 99.9% without killing yourself would be a memorable discovery.

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3 **pookiebear**  
Nov 27, 2009 11:54 AM

**Facts and figures**

Magnetic fields causing cancer?, i thought this was a physics site, come on. Ok there is a hazard from over exposure to UV, but we dont know the frequencies involved and the intensities.

I feel a more pressing hazard would be Ozone production and subsequent inhalation, but this should be easilly dealt with.

You cant comment on the hazards of such a device without facts and figures.

Quote:

*Originally posted by **inthend9***

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4

**Ardenay**

Nov 30, 2009 1:21 PM

Quote:

*Originally posted by **pookiebear***

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Numerous ordinary disinfectants such as hydrogen peroxide, ozone and chlorine are toxic and may be carcinogenic. Cold plasmas would fall into this category. Chlorine is most often used for water supplies because it persists as far as the consumer's tap.

Using such products involves calculated risk-taking. The word 'calculated' could better be replaced by 'reasoned', because the uncertainties make calculation very difficult. Such risks are taken when there is no alternative option. In some fields such as mine (drug impurity controls), the way risks are calculated is considered by some industry representatives to be excessively conservative.

It's true that if the baseline criterion 'Threshold of Toxicological Concern' were applied indiscriminately to chemical carcinogens, there would be little scope for progress in the field of disinfection.

There is a need for a cross-disciplinary debate on a suitable approach to the assesement of low-level carcinogenic risks.

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**abdilridahasaani**

Nov 30, 2009 1:42 PM

**Another action of basic plasma processes**

It has been known that basic processees in electrical discharges of various gases can be used to act on target or detectors by their extracted energy(or power). In this application, the qualitative feature which implies that plasmas tend to diffuse and extend into holes and open regions is experienced. This is due to the inherent kinetic pressure, concentration gradient of plasma particles, and other excitation and ionization processes. Similarly, plasma(needles) were suggested and constructed by Prof John A Goree and his plasma physics group at Iowa State University to be used in dentistry.

Dr A S Hasaani(CPhys, MInstP)

Dept. of Physics

College of Science

University of Baghdad

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