Non-contact device for living tissue sterilization and epistaxis control

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Technology description

Despite tremendous advances in surgical techniques and technology, a fundamental requirement for a successful outcome is proper sterilization of the surgical field. For routine and non-emergency procedures this is accomplished by pre-operative topical application of disinfectant solutions such as Betadine. However, there are many situations for which the use of chemical disinfectants is contraindicated. Many types of wounds are not amenable to chemical sterilization because of the potential for irritation, chemical burns, and tissue damage. Thus, there is a need for a nonchemical method of sterilization for a wide range of clinical applications that includes open wounds due to trauma, intraoperative sterilization of the peritoneum in the case of bowel perforation, post-operative wound care, surgery in the oral cavity, and diabetic ulcer care.

To address such needs, Drexel University engineers and clinicians have developed a Floating Electrode Dielectric Barrier Discharge (FE-DBD) system, which creates non-thermal or "cold" plasma discharge that rapidly kills pathogens on the surface of living tissue without harming the tissue itself. The device is positioned several millimeters away from the target tissue, and the plasma discharge is created in the space between the device and the tissue without forming a physical contact between them. Animal studies have confirmed the anti-microbial effectiveness and safety of the device. Complete killing of microorganisms has been achieved at plasma exposures at least 100-fold smaller than those causing tissue damage detectable by histological analysis. In-vitro experiments have proven the FE-DBD system's ability to eradicate every pathogen the researchers have tried, including parasites, fungi, bacteria and viruses, including those normally surviving harsh conditions such as hot springs. Additionally, the plasma discharge triggers blood coagulation and can be used for the control of epistaxis.

Application area

Sterilization of living tissues, including highly sensitive tissues, and open wounds
Control of epistaxis, or bleeding
Portable version can be used in field conditions

Advantages

Kills all known pathogens and microorganisms
Does not damage underlying living tissue
Can be used in open wounds and other sensitive tissues such as cornea, internal tissues (in surgery)

Institution

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