An innovative method of cold plasma for sterilization of medical devices

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In the medical field, the most commonly used methods for sterilization of medical devices are steam sterilization (autoclave), ionizing radiation and ethylene oxide. The evolution of medical techniques and technologies and the emergence of new materials have led to great advances in medicine. However, the sterilization of some new devices presents some difficulties linked to their vulnerability to sterilizing agents. Therefore, a new sterilization process has been studied for over 10 years: cold plasma sterilization. The idea is to expose a sample to plasma created in a chamber at atmospheric pressure or in vacuum condition. Many studies have demonstrated the efficacy of plasma on microorganisms inactivation [1, 2, 3]. But, these methods do not permit to ensure the preservation of the sterility during and after treatment. Moreover packaging and storage methods of sterile equipment represent an important part of the process leading to obtain sterile conditions according to European norms (EN ISO 11607, EN 868).

Taking these facts into consideration, we have developed a process which allows the conservation of the sterile state by creating a plasma treatment directly inside the transport pouch. A sample packed in a sealed pouch is subjected to vacuum. Then a gaseous mixture is injected into the pouch through a filter. The plasma is generated only in the bag and not in the chamber. This method is protected by a patent (PTC/FR2011/052199).Various gaseous mixtures have been tested and applied to *Pseudomonas aeruginosa* suspensions or biofilms on hydroxyapatite coated titanium (TA6V).

Figure 1: *Generated plasma inside the packaging bag*

Our results reveal that *Pseudomonas aeruginosa* suspensions and biofilms are affected by this sterilization method. We observed a 106 Log decrease of the viability of the bacteria in suspensions which highlights the capacity of this technology to be efficient according to European Norms. The optimization of the parameters used could increase the efficiency on bacterial biofilms.

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References

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