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Endotoxin Decontamination of Intraocular Lenses and Surgical Instruments using Gas Plasma

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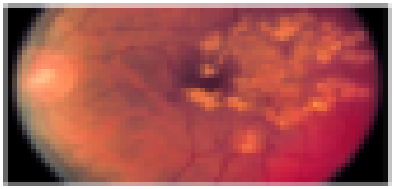
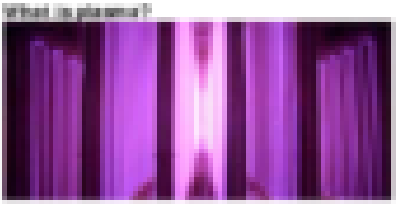


Toxic Anterior Segment Syndrome (TASS) following cataract surgery is an acknowledged concern of the American Society of Cataract and Refractive Surgery (ASCRS). Characterized by postoperative inflammation to intraocular structures, TASS has been attributed to noninfectious agents accessing the anterior chamber of the eye. Most likely sources of contamination are from inadequate cleaning of surgical instruments and of the implanted IOL. Of particular concern are surface adsorbed pyrogens that are difficult to detect and notoriously difficult to remove, particularly from heat sensitive substrates.

Gas plasma is a powerful and safe method of significantly reducing the presence of surface bound endotoxins. Low temperature (<50°C) plasma discharge has demonstrated >3 log count reductions of surface immobilized endotoxin bioactivity. Plasma is a dry process that eliminates the liabilities of wet cleaning and is a technique that can be easily implemented in cleaning practices for intraocular devices and related surgical instruments.

What is plasma?



Plasma is a gas energized to a state of electrical conductivity. An applied electric field accelerates electrons that ultimately collide with gases that are fed into the chamber. Upon collision these gases are chemically activated creating a highly reactive environment that is used to change the properties of surfaces without affecting the bulk material. For example plasma activated oxygen reacts with surface bound hydrocarbons converting them mainly to CO_2 and H_2O.

Plasma is a powerful tool in solving surface preparation problems. It provides a reliable, consistent, and environmentally friendly method of critically cleaning surfaces from organic contamination at the molecular level.

Mechanism of plasma deprogeneration

There are three fundamental components of a plasma that influence the surface properties of materials; chemical, physical and irradiative.

a. *The Chemical Component*

The rate of removal of surface immobilized endotoxins has a strong dependence on the presence of plasma activated oxygen. Detection of C_xO_y, N_xO_y, and OH, products in the plasma strongly suggest that surface contaminants are oxidized, volatizing into these products. These volatile products are then removed from the plasma system by the pump.