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Ways to decrease the Adhesion of *Pseudomonas Aeruginosa* Bacteria to the Surfaces of Endotracheal Tubes

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INTRODUCTION: The objective of the research presented here is to develop non-adhesive surface coatings on endotracheal tubes, in order to prevent bacterial growth. Many hospital-acquired pneumonias follow colonisation of the intubation devices by *Pseudomonas aeruginosa*[1]. This could be prevented by making the surface of the tubes non-adhesive to bacteria. Furthermore, such tubes would prevent infection without the use of antibiotics and, thus, discourage the formation of antibiotic resistance in bacteria.

METHODS: The surface of the endotracheal tube is modified using several approaches including dielectric barrier discharge treatment and wet chemical treatment. The hydrophilicity of the surface is, in this way, increased which hinders the adhesion of substances in body fluids that can allow bacteria to anchor. Also, by including silver ions, the tube surface can be made toxic to bacteria (but not to humans), which further decreases bacterial adhesion and growth[2]. The present research develops and examines different surface modifications of medical grade poly(vinyl chloride) tubes using techniques such as X-ray Photoelectron Spectroscopy (XPS), Fourier Transformed Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM). These techniques give the possibility to monitor structural changes and obtain chemical information about the surfaces. In a later stage of the project, the altered surfaces will be tested for adhesion of different strains of *P. aeruginosa*. This will enable the biological response to be correlated to the chemical properties of the surfaces, and make it possible to identify the most bacterial resistant surface

RESULTS & DISCUSSION: Both the wet chemical treatment and dielectric barrier discharge treatment increase the roughness of the surface (Fig 1). The wet chemical treatment is more efficient in producing a large uptake of silver ions with resulting silver content of approximately 4-7 at % (obtained from XPS) while the discharge treatment only results in 2-3 at %.

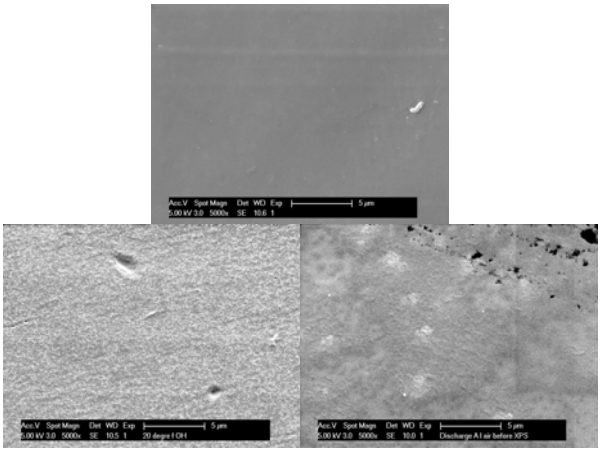

Fig. 1: Effect of wet chemical and dielectric barrier discharge treatments on surface morphology: non treated surface (top) vs. wet chemically treated (bottom left) and discharge treated (bottom right).

XPS data show that silver is present in ionic form. Furthermore, FTIR and XPS data suggest that the interaction between the silver ions and tube surface is through bond formation with chloride and/or oxygen containing groups.

CONCLUSIONS: The wet chemical treatment of the surface gives a higher content of silver ions than the dielectric barrier discharge treatment. Thus, this treatment is hypothesized to be the most efficient one for reduction of bacterial adhesion.

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