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INTRODUCTION: The aim of this research was to optimize titanium (Ti) and titanium alloy (NiTi) surfaces coated with Polyelectrolytes Multilayer Films (PMF)[1]. We studied different biomedical parameters related to this surface treatment in order to develop specific biomedical applications in the dental field (dental implants, endodontic instruments, orthodontic arches). Firstly, we determined if PMF had a detectable physisorbtion on Ti and NiTi. Secondly, we studied biocompatibility of poly-ethyleneimin (PEI), the precursor based-layer of PMF. Finally, sterilization tests were realized to analyze their potential impact on the physico-chemical structure of PMF.

METHODS: Two types of films were caracterized : polystyrene-sulfonate/polyallylamine hydrochloride films PEI-(PSS/PAH) and hyaluronic acid/poly-L-lysine films PEI-(HA/PLL). Physico-chemical characterization was carried out by tensiometry, atomic force microscopy (AFM), and confocal microscopy. A biological study using human fibroblasts was carried out. Cell response was observed after 0, 2, 4 and 7 days *in vitro* using morphologic criteria (scanning electron microscopy), adhesion (fluorescence microscopy image analysis), and proliferation (Methyl Tetrazolium Test). Three methods of PMF sterilization were compared: ultraviolets (UV), ethylen oxyde (ETO), and autoclave. PSS/PAH films were characterized by the same physico-chemical tests and biological studies after the sterilization process.

RESULTS: Results showed that PSS/PAH films were more biocompatible than HA/PLL films on both metallic biomaterials. The precursor based-layer study demonstrated that PEI was not biocompatible[3]. PMF sterilized by autoclave showed similar biocompatibility. Such results could not be found with UV and ETO. Nevertheless, some investigations have to be realized to prove that the structure of PMF was not perturbed after these processes.

DISCUSSION & CONCLUSION: Based on our results, we decided to use PAH as the precursor based-layer (positively charged) and to stop using PEI on biomaterials made of Ti or NiTi. We are now planning to integrate bioactive molecules between layers of the PMF. To this aim other parameters need to be studied to characterize *in vivo* potential biomedical application, such as films aging in the oral cavity, as well as in salivary or fluored environment.

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