UNIVERSITATEA DIN BUCUREȘTI
VIRTUTE ET SAPIENTIA

CIWC-2 2020 2nd Coatings and Interfaces Web Conference

Novel Coatings Based on Nanostructured Cefepime-Functionalized Magnetite for Implantable Devices

Miruna S. Stan [1,2,3*], *Ionela Cristina Nica* [1], *Anca Dinischiotu* [1], *Valentina Grumezescu* [4], *Alexandra Elena Stoica* [2], *Alina Maria Holban* [3,5] *and Alexandru Grumezescu* [2]

1 Department of Biochemistry and Molecular Biology, Faculty of Biology, University of Bucharest, 91-95 Spl. Independentei, 050095 Bucharest, Romania
2 Department of Science and Engineering of Oxide Materials and Nanomaterials, Faculty of Applied Chemistry and Materials Science, University Politehnica of Bucharest, 1–7 Polizu Street, 011061 Bucharest, Romania
3 Research Institute of the University of Bucharest – ICUB, 91-95 Splaiul Independentei, 050095 Bucharest, Romania
4 National Institute for Lasers, Plasma and Radiation Physics, Măgurele 077125, Romania; valentina.grumezescu@inflpr.ro
5 Microbiology Immunology Department, Faculty of Biology, University of Bucharest, 1–3 Portocalelor Lane, Sector 5, 77206 Bucharest, Romania
* Correspondence: miruna.stan@bio.unibuc.ro

AIM

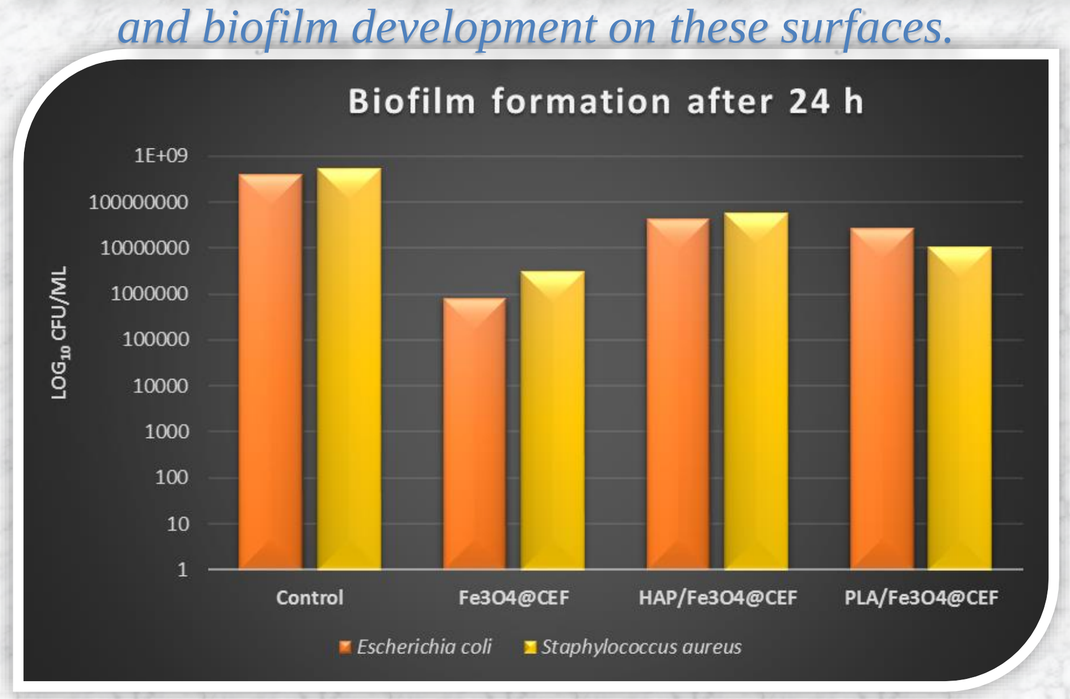
The aim of this study was to obtain biocompatible coatings based on polylactic acid, hydroxyapatite and nanostructured Cefepime-functionalized magnetite for enhancing the activity of next-generation implants against antibiotic-resistant pathogens.

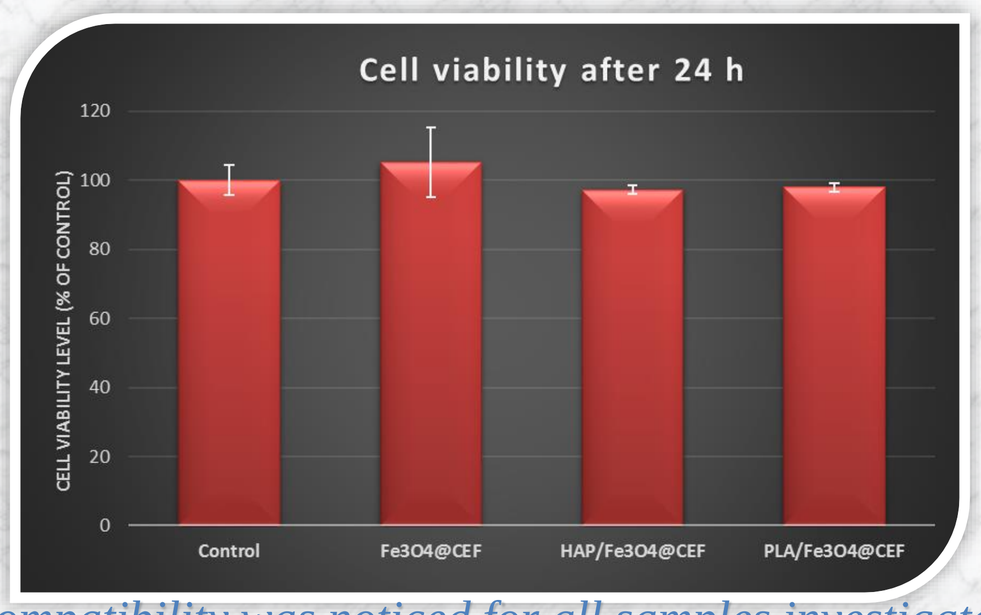
MATERIALS AND METHODS

- Mixtures of various ratios of polylactic acid, hydroxyapatite and nanostructured Cefepime-functionalized magnetite (Fe_3O_4@CEF, HAP/Fe_3O_4@CEF and PLA/Fe_3O_4@CEF) were obtained and deposited on glass slides by Matrix Assisted Pulsed Laser Evaporation (MAPLE).
- The *in vitro* biological effects of these coated surfaces on murine normal osteoblasts (MC3T3-E1 Subclone 4 (ATCC cat. no. CRL-2593)) were investigated by observing their morphological features and measuring the cell viability (MTT test) and nitric oxide (NO) release (Griess test) as an indicator of inflammation and cell death.

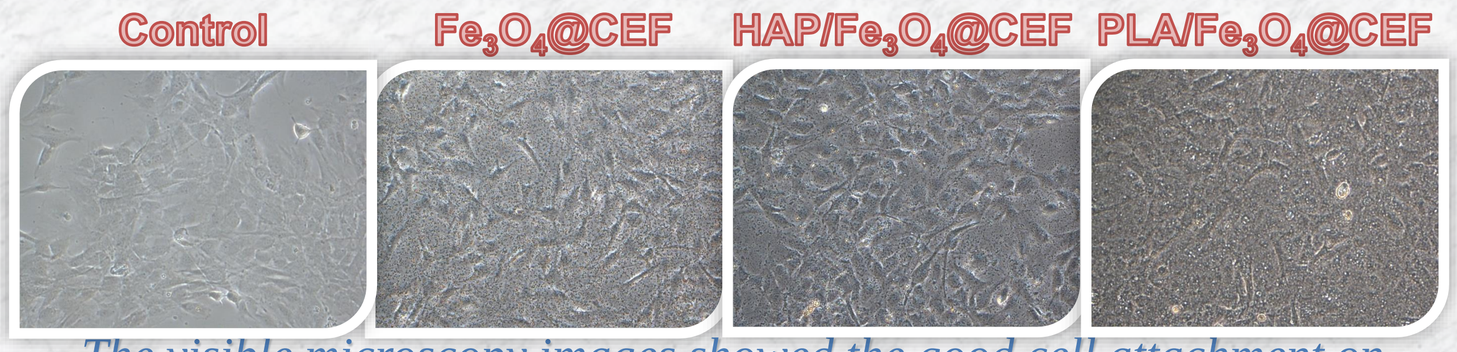
RESULTS AND DISCUSSION

The coatings succeeded to reduce the microbial attachment as well as the subsequent Escherichia coli colonization and biofilm development on these surfaces.





A good biocompatibility was noticed for all samples investigated within this study, according to formazan-based assay.



The visible microscopy images showed the good cell attachment on these modified surfaces and proved that the proliferative capacity of osteoblasts was not disturbed in the presence of tested samples.

No increase in NO level was induced after 24 h of cell growth on these coated glass slides.

CONCLUSIONS

These novel coatings can become suitable surfaces for implantable devices with an enhanced biocompatibility and reduced bacterial colonization. In conclusion, these novel coatings can become suitable surfaces for implantable devices with an enhanced biocompatibility and reduced bacterial colonization.

ACKNOWLEDGEMENTS

This work has been funded by the Operational Programme Human Capital of the Ministry of European Funds through the Financial Agreement 51668/09.07.2019, SMIS code 124705.