In Vitro Cytotoxicity Testing of Wood-Based Biomorphic SiC Ceramics

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AIM

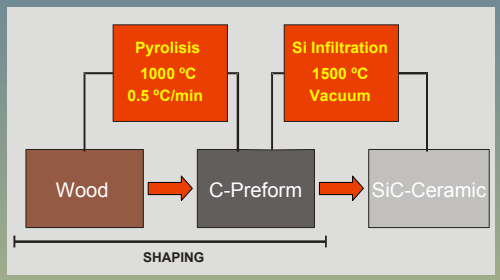
To study the ***in vitro*** **cytotoxicity** of **biomorphic SiC** ceramics obtained from **Eucalyptus, Beech and Sapeli** using **MG-63 human osteoblast-like cells**.

INTRODUCTION

- Biomorphic SiC ceramics are very promising materials for implant technology due to:
  - Excellent mechanical properties.
  - Easy shaping.
  - Controllable microstructure.
  - Porosity range.
- Cytotoxicity test is a good beginning to ensure the biological compatibility of SiC.

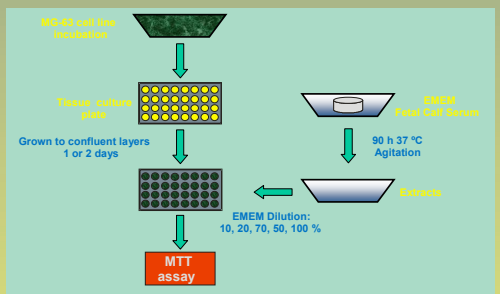
EXPERIMENTAL

Fabrication of SiC Ceramics



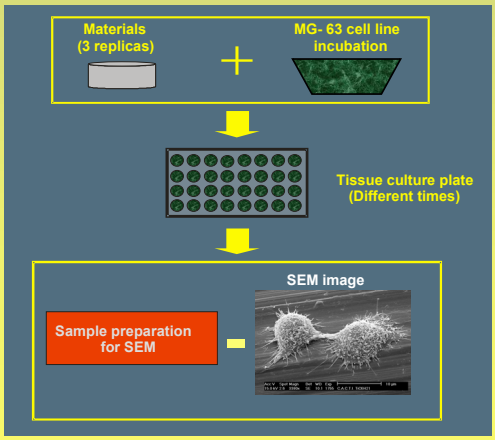
Cytotoxicity Protocol

Citotoxicity Test



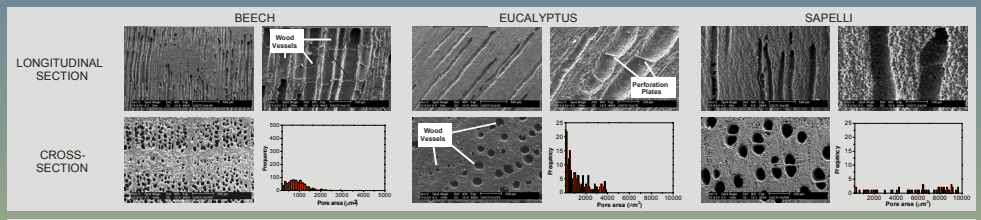
MG-63 Cells Seeding and Proliferation Protocol

Proliferation Test



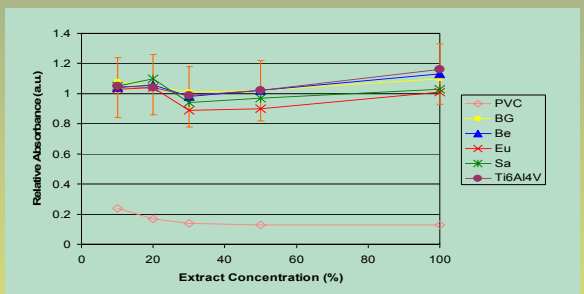
RESULTS

Microstructure Analysis



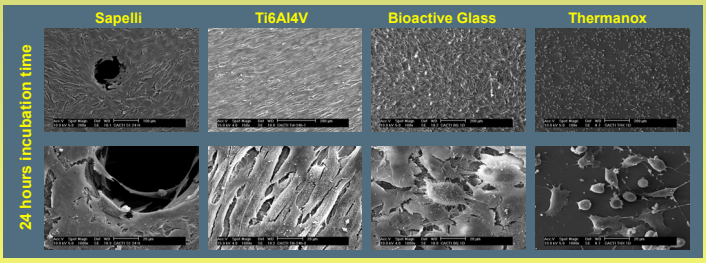
- They retain the microstructural details of the starting wood fibrous structure.
- A large variety of porous size and porosity grade is offered.
- The cellular microstructure of bone is resembled, which can provide a route for migration of osteogenic cells and, consequently, new bone formation within the implant.

Cellular activity

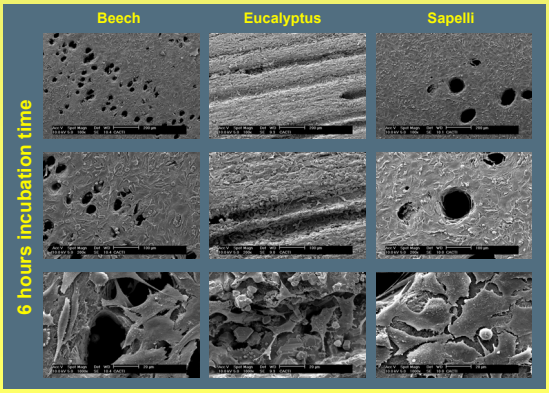


- PVC extract was cytotoxic for MG-63 monolayers, validating the extraction procedure.
- The extracts of reference materials (Ti6Al4V, Bioactive glass) did not affect cellular activity.
- The same result was obtained for sapelli, eucalyptus and beech-based SiC ceramic.

MG-63 Cells Attachment and Proliferation: SiC and Reference Materials



- The biomorphic Sapeli-based SiC ceramics supports the cellular monolayer formation and produces the same cellular morphology as Ti6Al4V and bioactive glass or negative control surfaces (Thermanox).
- The same results were obtained for the beech and the eucalyptus-based SiC ceramics.



- The attachment of the cells occurs in the same way in all three ceramics tested.
- The cells proliferate in the same efficient manner in all the parts of the ceramic discs including pores and channels.
- Profusion of filopodia and lamellipodia (cytoplasm extensions) were observed.
- Neighboring cells maintained physical contact with one another through cytoplasm extensions.

CONCLUSION

- **The bioacompatibility of this innovative SiC material is demonstrated.**
- **The biomorphic SiC ceramics did not produce a cytotoxic response on the MG-63 osteoblast-like cells.**
- **The cellular activity for SiC ceramics was similar to well known implant materials like Ti6Al4V and bioactive glass.**

ACKNOWLEDGEMENTS

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