Effects of 3D-printed nickel-free stainless steel on osteoblasts *in vitro*

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CELL BIOLOGY

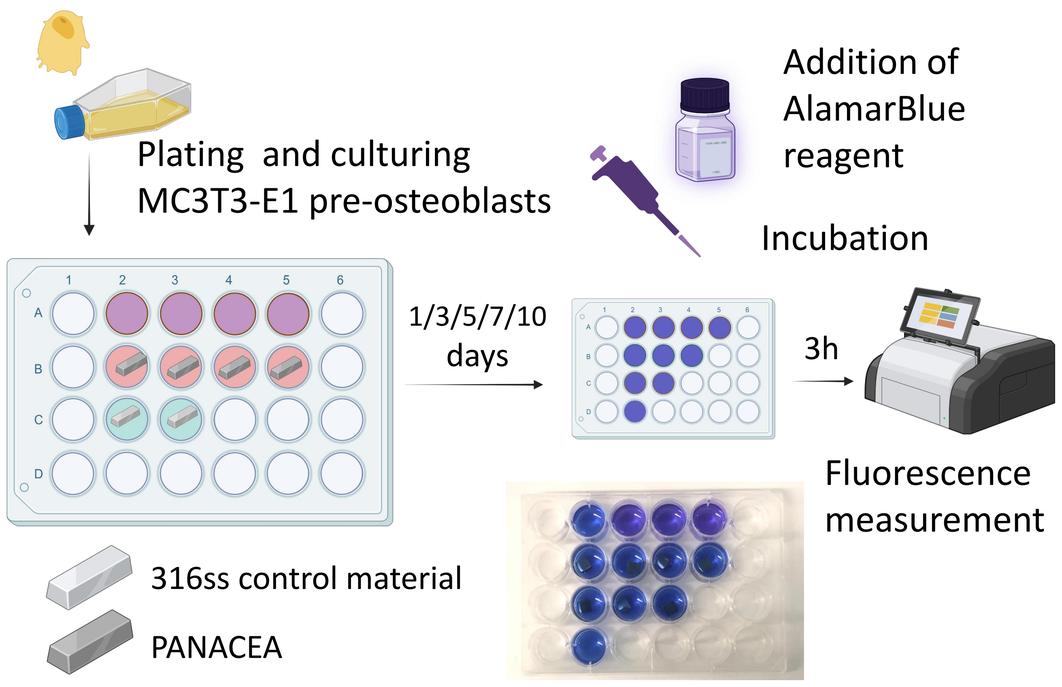
INTRODUCTION

- Osteoblasts are bone-forming cells derived from mesenchymal stem cells. During aging, the number and differentiation capacity of stem cells decrease, resulting in reduced bone regeneration ability. Consequently, fractures or bone defects may not heal as effectively.
- Biomaterials are synthetic or biologically derived materials used to repair damaged tissue and restore its function. Materials such as metals and metal alloys can be used in the production of prosthetics to restore the normal anatomical structure of tissue or organs.
- 3D-printing enables the production of patient-specific implants. However, nickel, which is commonly used in metal alloys, can pose problems, as it can cause allergic reactions and may have cancerogenic properties.

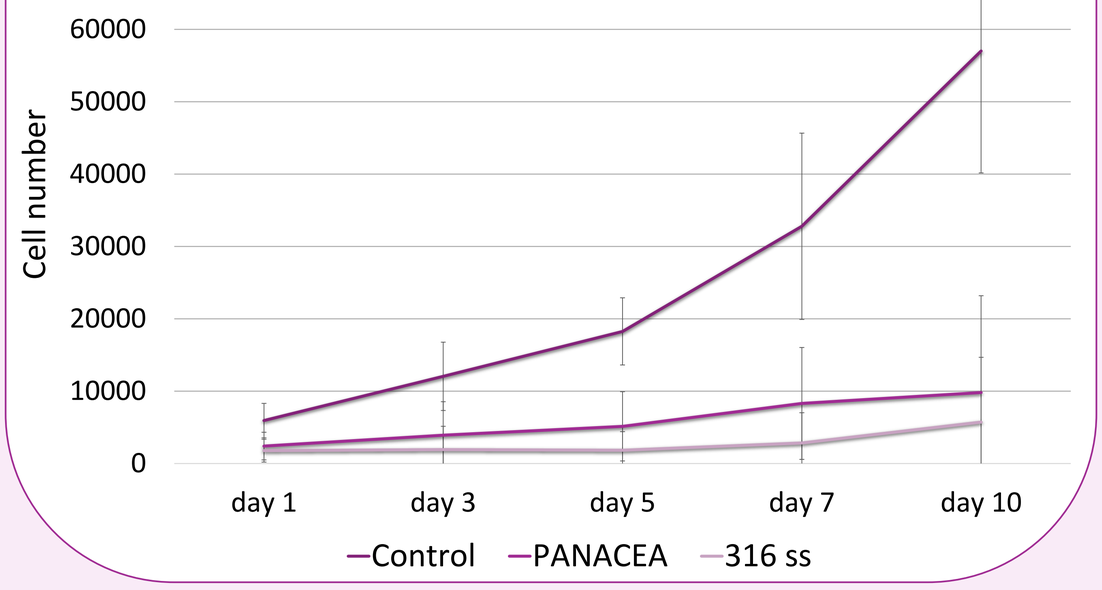
AIM: to study how 3D-printed nickel-free stainless steel PANACEA, affects osteoblast viability and differentiation.

Osteoblast viability test

AlamarBlue

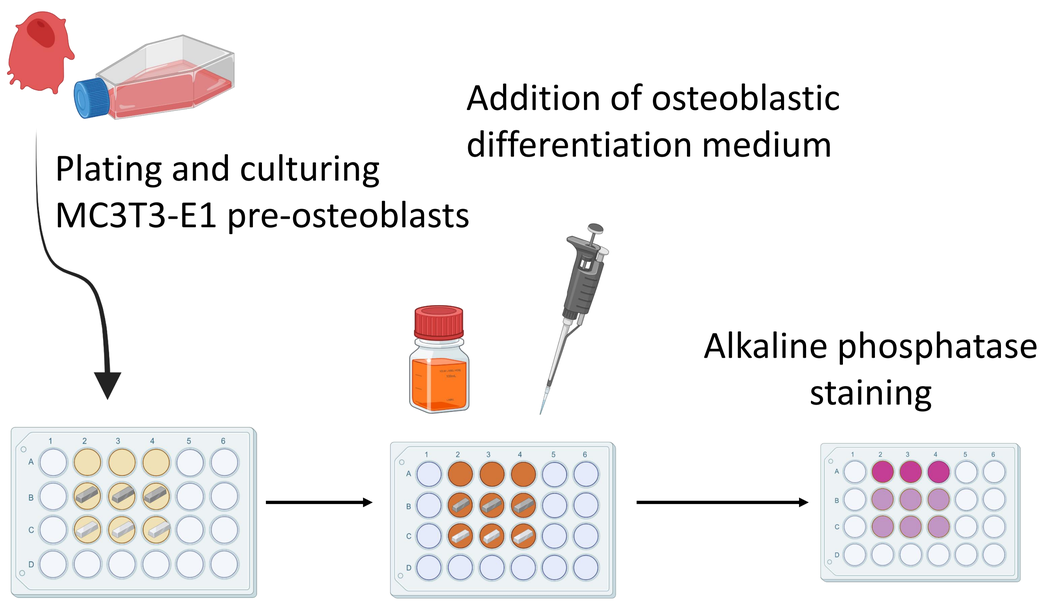


Cells grew better on normal cell culture plastic compared to cells cultured with metals. The difference in cell growth between PANACEA and 316ss samples was small.

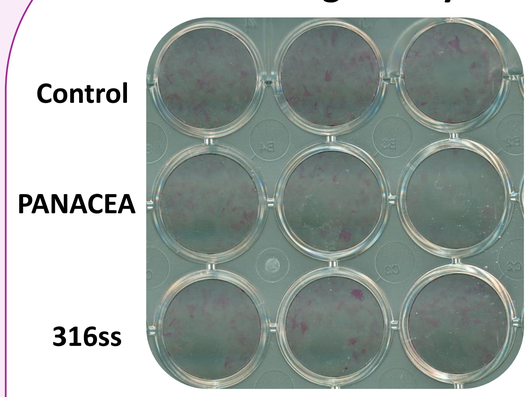


Osteoblastic differentiation test

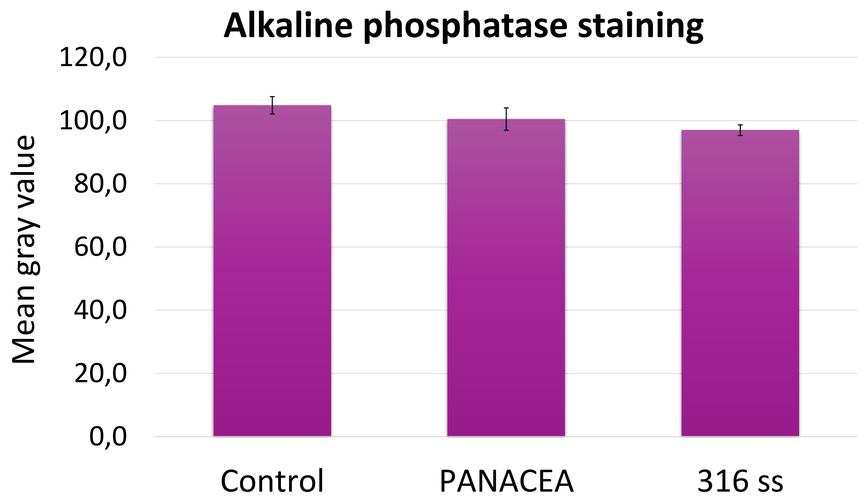
Alkaline phosphatase (ALP) staining



ALP staining on day 14



Cells differentiated better into ALP-positive osteoblasts on normal cell culture plastic compared to cells cultured with metals. Even though the difference between control, PANACEA and 316ss was clear, it was relatively small.



CONCLUSIONS: PANACEA is a promising starting material for 3D-printable prostheses. Even though cell growth was weaker with metals, the cells grew better with PANACEA than with nickel-containing 316ss. It is possible that nickel ion release is one reason for the poorer cell growth in the presence of 316ss.