

Titanium Implants with NanoSurface: An Evidence-Based Update

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Disclosures

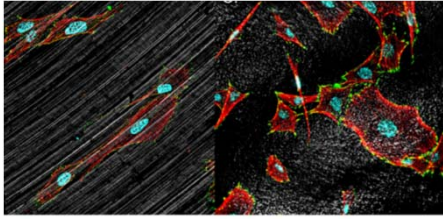
- Paid consultant for Titan Spine LLC
- Research support from Institut Straumann AG
- Research support from AB Dental
- NIH R01 AR052102

What happens when you place a Ti or Ti-6Al-4V implant in bone?



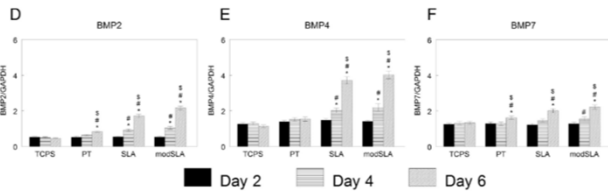
Achieving Stable Osseointegration

Surface topography and chemistry cause a change in MSC cell shape.

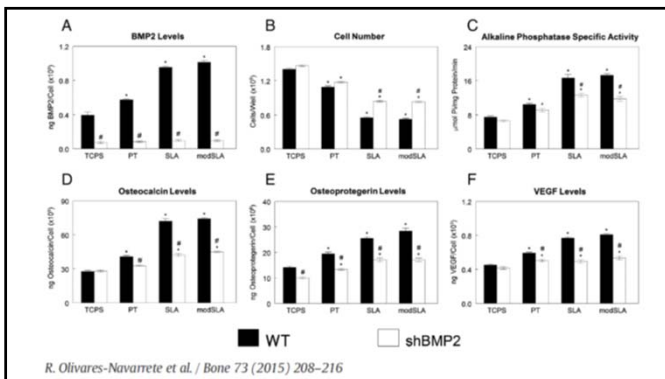


Banik et al., Frontiers in Bioengineering and Biotechnology, 2016

MSC differentiation on a micro/nano rough surface is rapid.

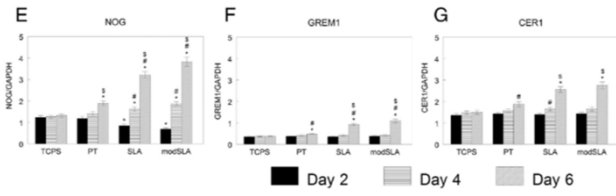


R. Olivares-Navarrete et al. / Bone 73 (2015) 208–216



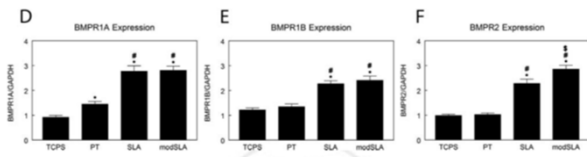
R. Olivares-Navarrete et al. / Bone 73 (2015) 208–216

The action of endogenous BMP2 is regulated and coordinated.

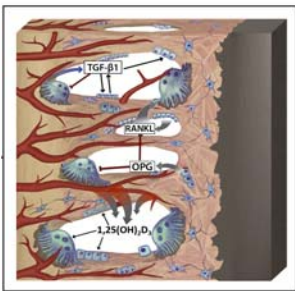


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Cells can respond via autocrine and paracrine mechanisms.

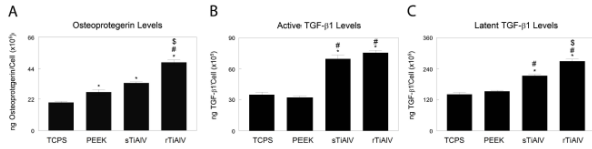


J Biomed Mater Res A, 2015 May;103(5):1721-31

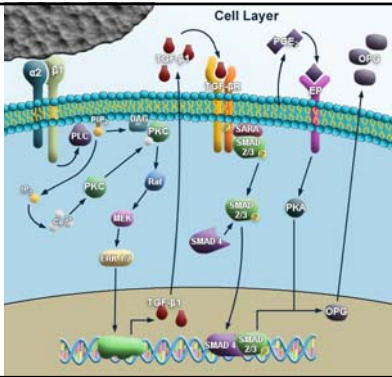


Remodeling after primary bone formation is mediated by the surface.

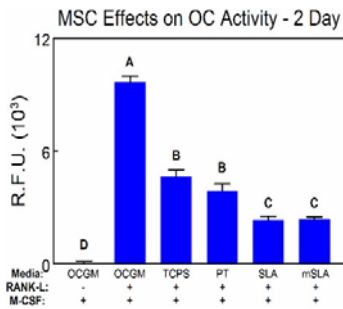
HMSCs on rough Ti alloy produce higher levels of factors that reduce osteoclastic bone remodeling, resulting in net new bone formation.



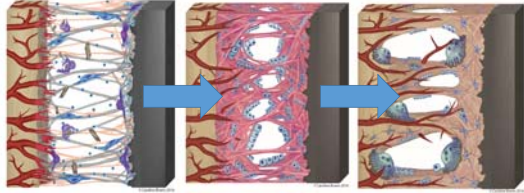
How can the surface have an effect?



MSCs production of factors that reduce osteoclast activity is enhanced when they are cultured on microtextured Ti surfaces...



Net effect is net new bone and regulated bone remodeling.



What makes nanoLOCK® different?

- Macroscale, microscale and nanoscale topographic features on the surface.
- MSCs are able to attach, differentiate into osteoblasts, and produce factors that stimulate bone formation while delaying bone resorption.
- Cells that interact with the surface are able to modulate activity of cells in the environment to achieve osteointegration and stabilization of the implant.

Thank you!

