

Hacia una nueva generación de implantes ortopédicos

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UNIÓN EUROPEA
FONDO EUROPEO DE
DESARROLLO REGIONAL
"Una manera de hacer Europa"



MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD



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bionand



Centro Andaluz de
Nanomedicina & Biotecnología



El 80% deben ser repuestas
después de 10 años

70.000 prótesis implantadas cada año

**UNA QUESTIÓN
DE EQUILIBRIO**



TISSUE ENGINEERING

Collagen I
Ceramics
Titanium

SCAFFOLDS

MSCs

CELLS

SGNALING

TGF-beta1
FGFb
BMP-2
RGD

- CBD

A NEW KIND OF PROSTHESIS: Porous Titanium

- Minimal amount of metal: just that needed to achieve **mechanical stability** (up to 80% less metal used)
- Bone-like **elastic properties**
- **High porosity** allows **bone ingrowth**
- **Better osseointegration**

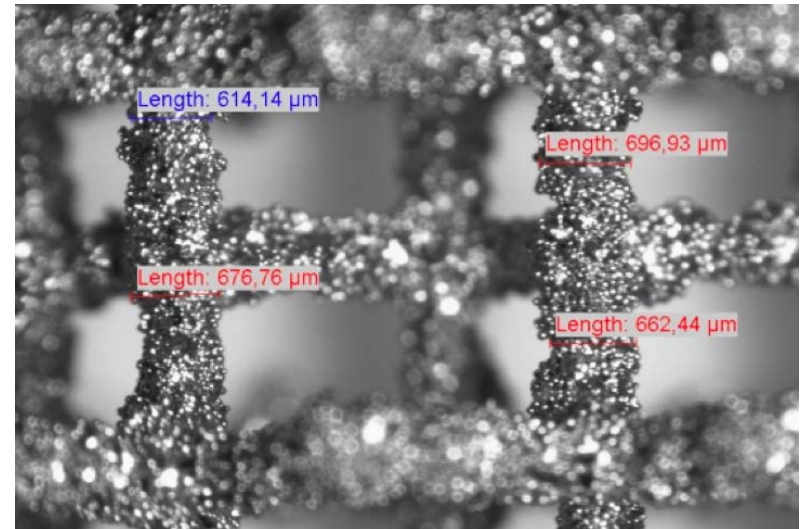


Electron Beam Melting (EBM) Technology

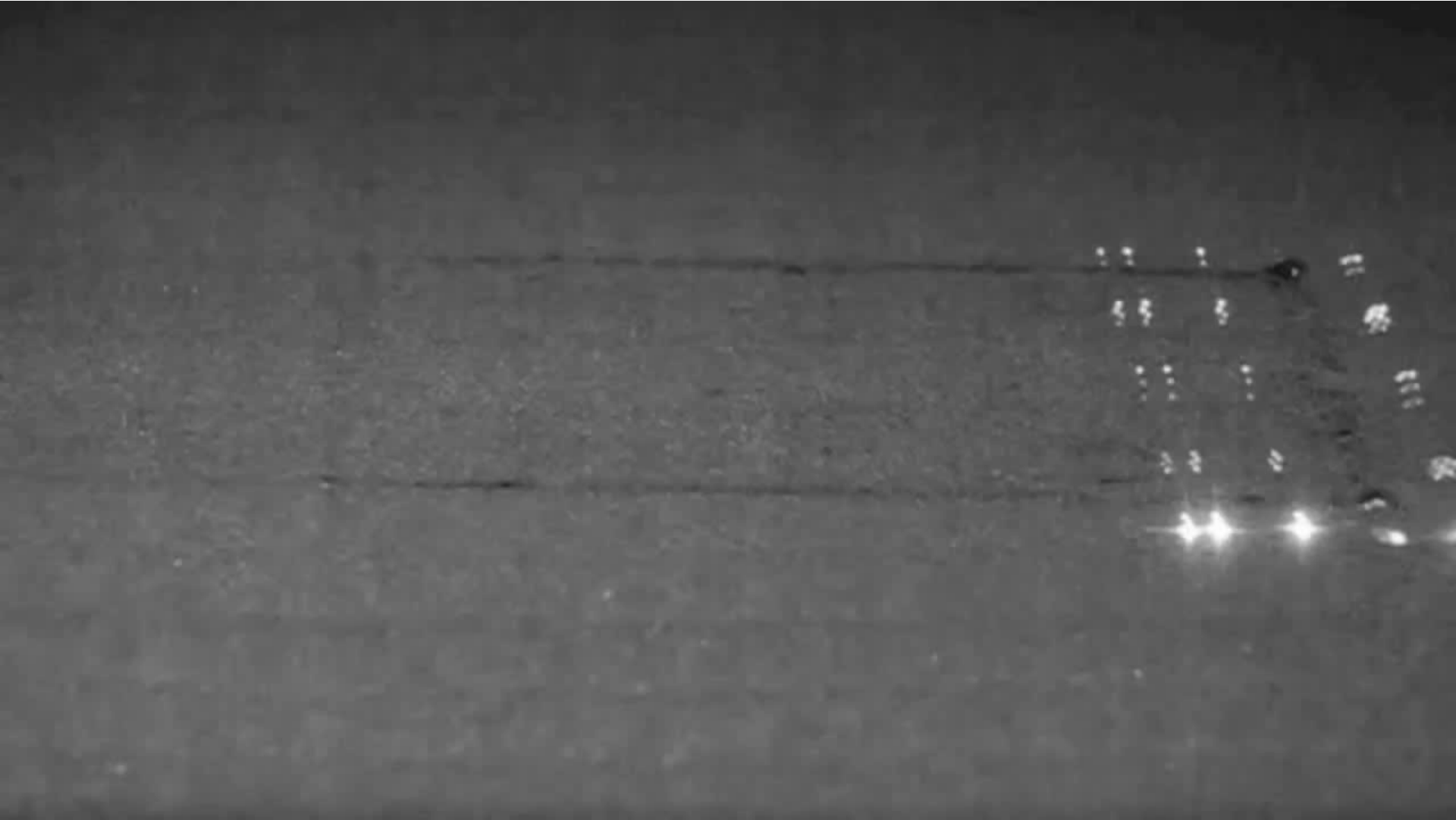
EBM-Sintering Advantages

- No geometry limitations
- Changing shapes do not increase costs

Ti₆Al₄V ELI powder



ELECTRON BEAM MELTING (EBM)

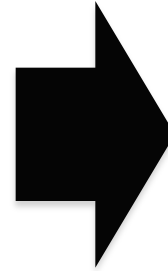
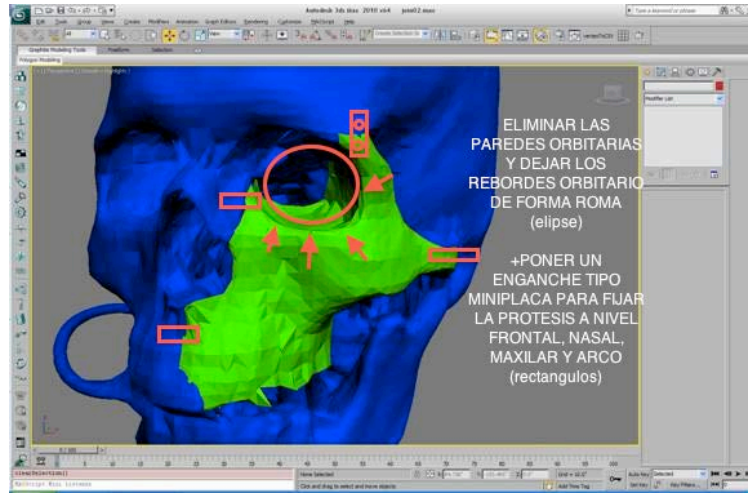


GIR 26 DO7 SH
2 L3 M1

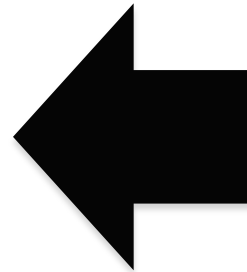
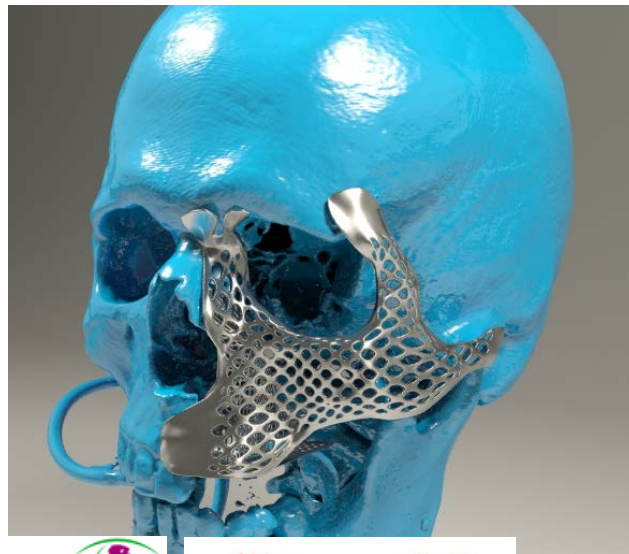
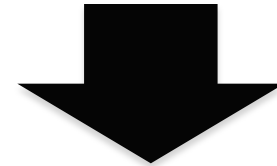
GIR 19 DG7 SH
SPZ L3 M2

A NEW KIND OF PROSTHESIS

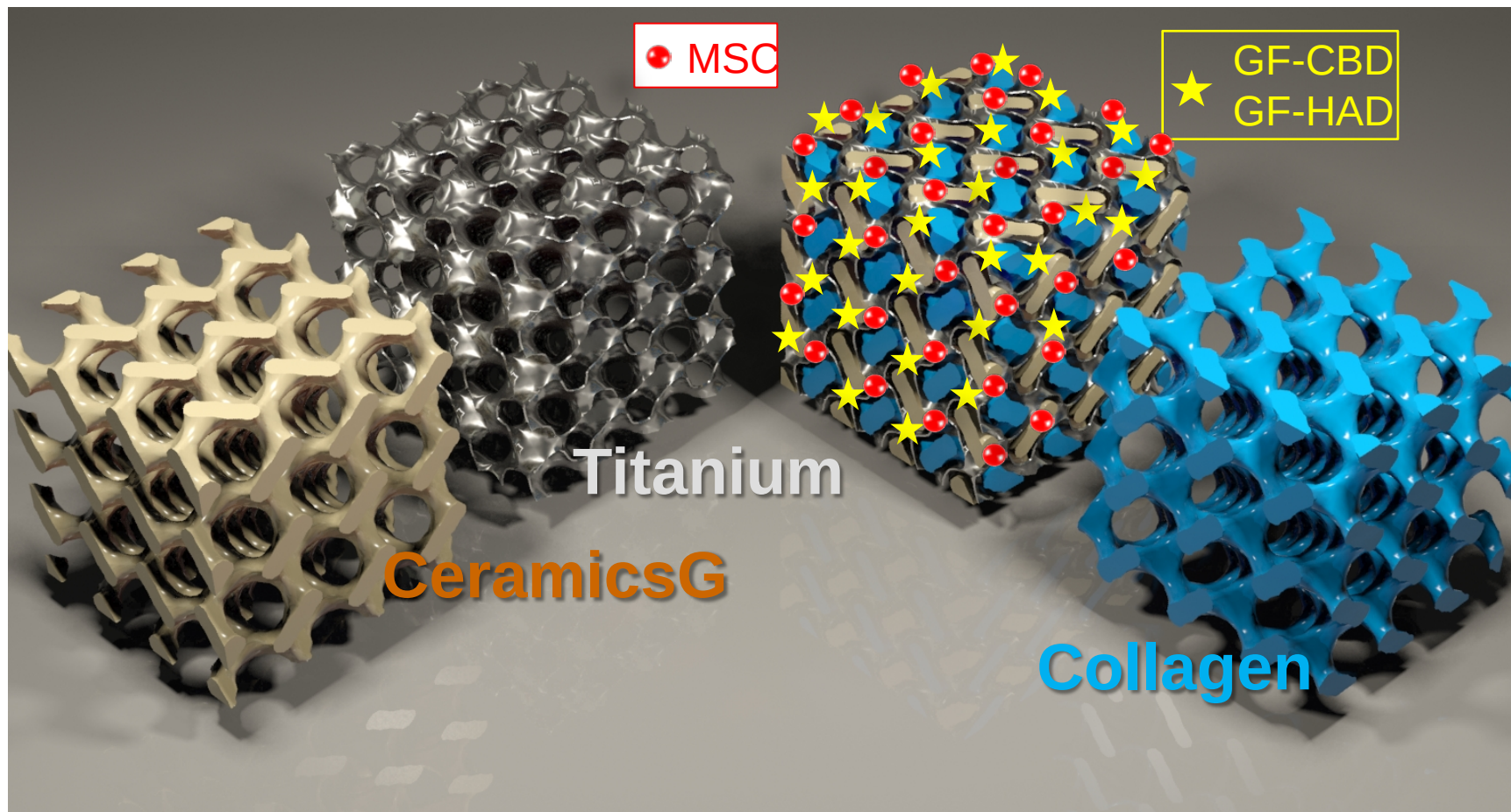
CUSTOM-MADE PROSTHESES



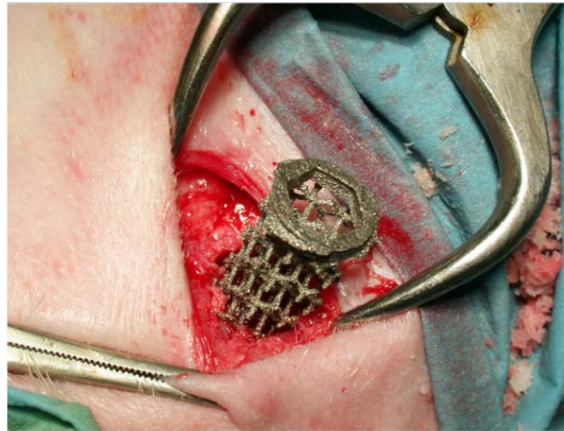
itc



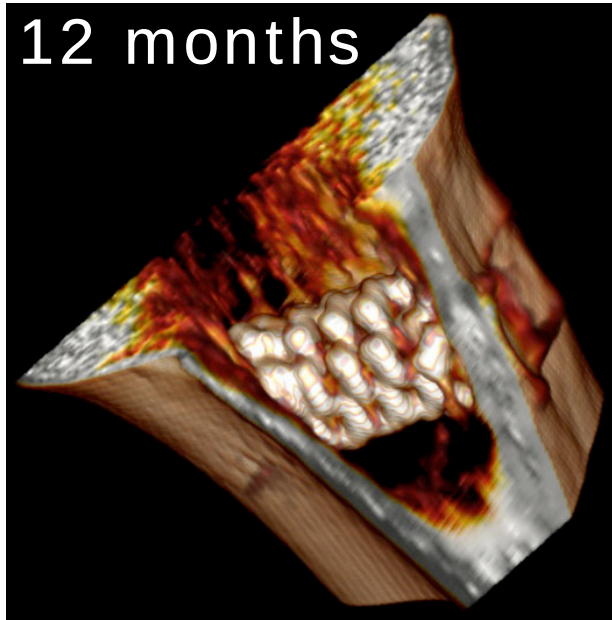
FUNCTIONALIZATION OF TITANIUM



Biocompatibility



12 months

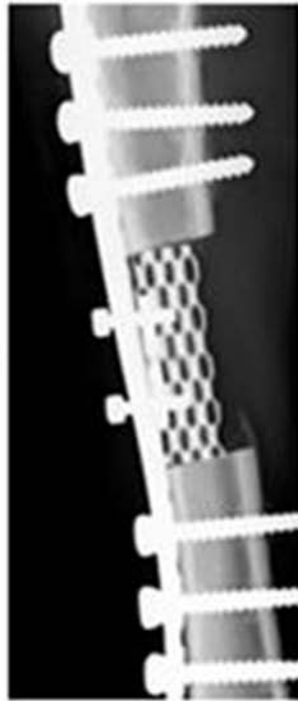


Exakt Equip for histology of hard materials

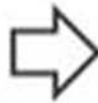




Surgery



Post-surgery



2 months



reinforced bone!



9 months



HISTOLOGY

A NEW KIND OF PROSTHESIS: Functionalization

Macroporous EBM-sintered
Titanium Scaffold

Mechanical stability



Tissue Engineering (TE)

Osseointegration



Biomaterial

Collagen
HA

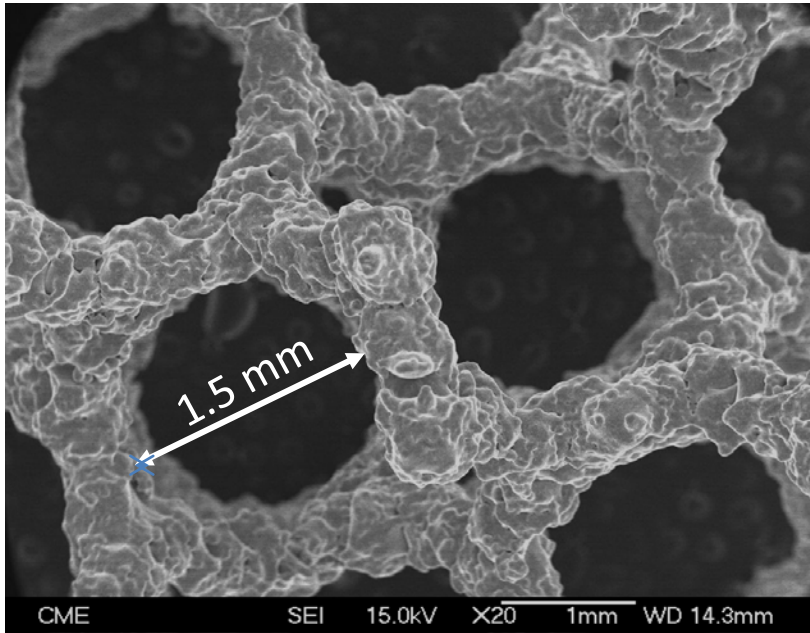
Cells

MSC

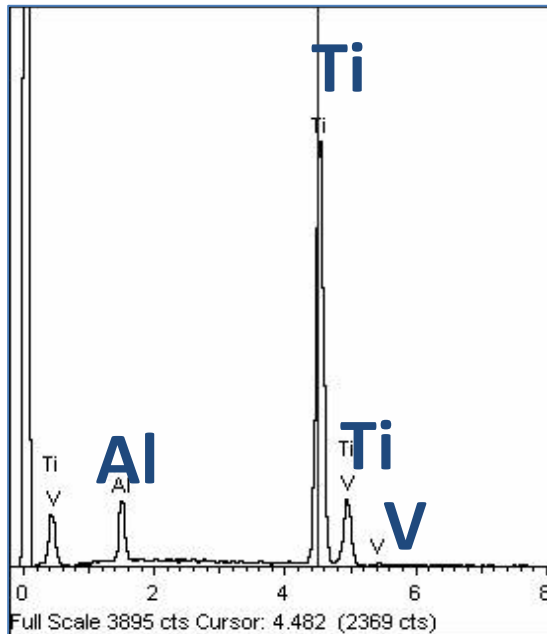
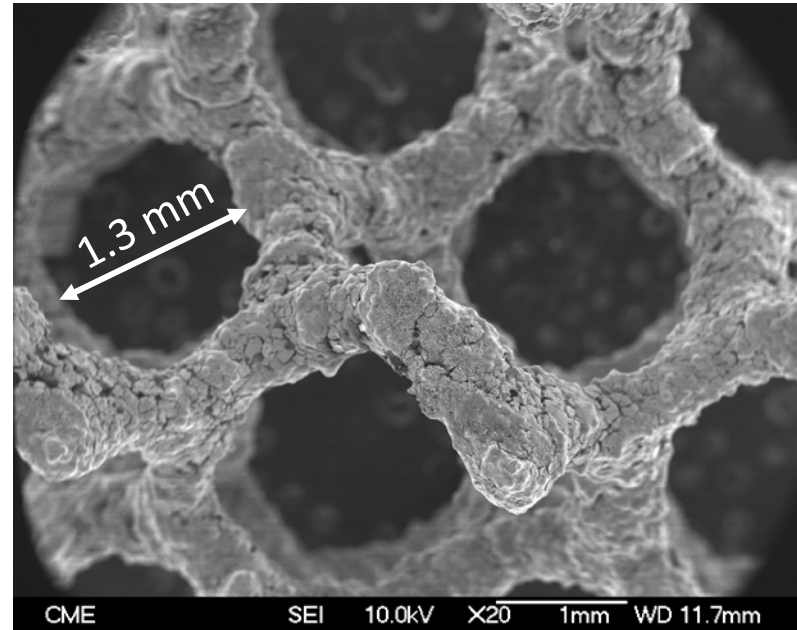
Osteoinductive
molecules

rhBMP2-CBD
CBD-RGD
HABD-RGD

Uncoated titanium



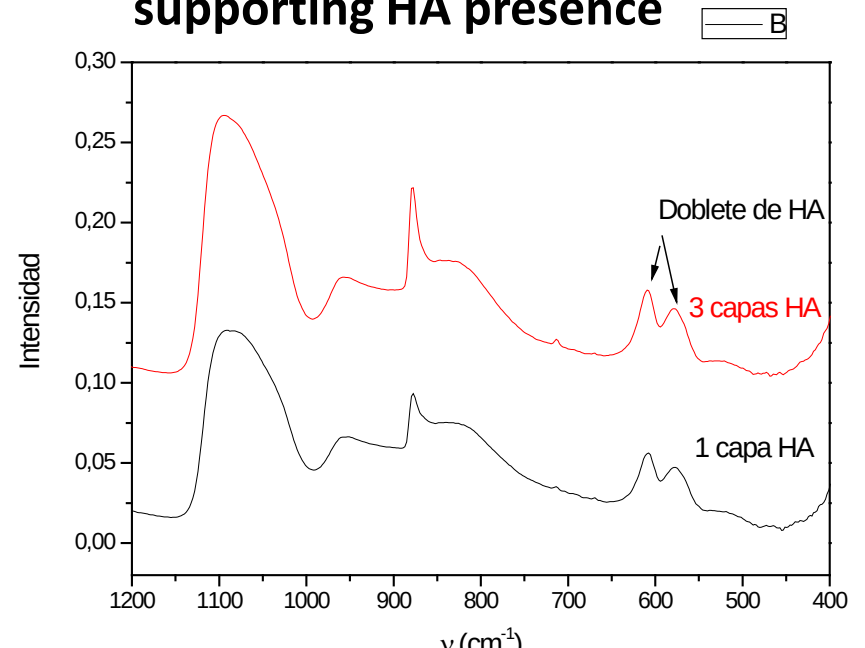
Titanium coated with 3 layers of HA



María Vallet



supporting HA presence



In vivo experimental design



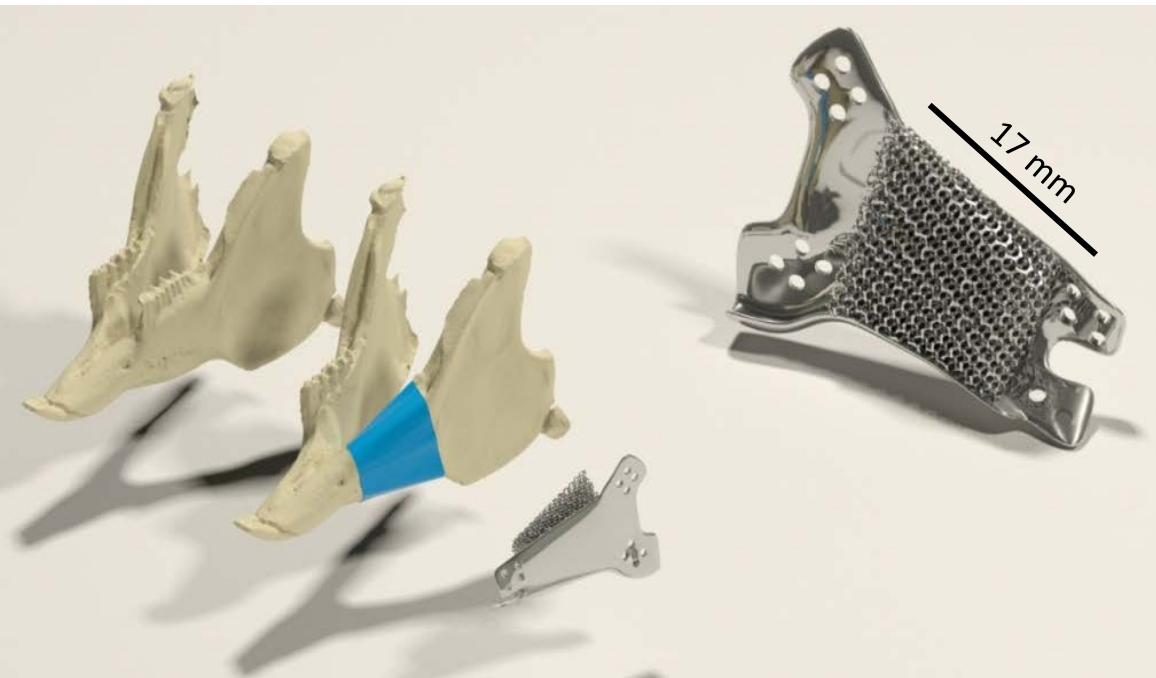
EXPERIMENTAL DESIGN

GROUP	2 WEEKS	4 WEEKS
Ti-Collagen-BM-MSC	6 knees	6 knees
Ti-Collagen+BMP2	6 knees	6 knees
Ti+Collagen	6 knees	6 knees

EXPERIMENTAL MODEL:

- Rabbit medial femoral condyle
- 9 animals x 2 sampling points
- Both knees (2 implants/animal)

Mandibular osteonecrosis : segmental defects in rabbit





J. Santamaría



M. Cifuentes



PMª Arrabal



G. Rico



S. Claros



P. Jiménez



JA. Andrades



A. Cosano



L. Ramiro



R. Visser



L. Santos



M. Marí Beffa



J. Ruiz



A. Díaz