



Polímeros Aplicados a Área Médica

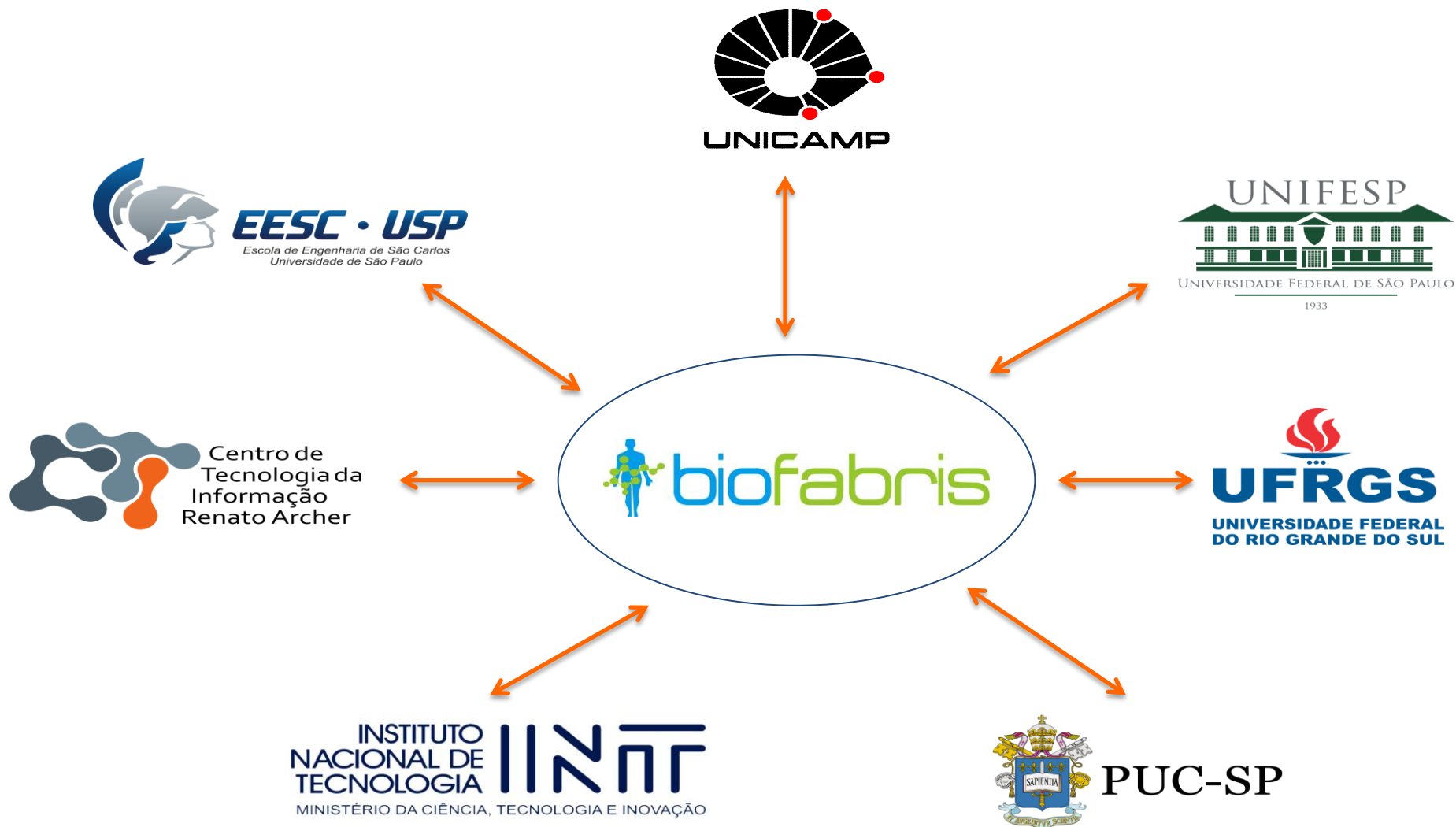
André Jardini, Dr.
Pesquisador Sênior
Instituto Nacional de Ciência e Tecnologia de Biofabricação



BIOFABRIS - UNICAMP



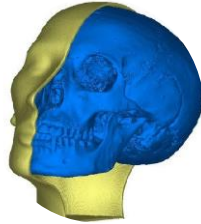
PARCEIROS - BIOFABRIS



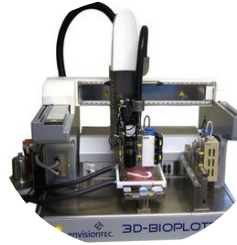
PESQUISAS



Células



Tomografias



Impressoras 3D



Biomateriais



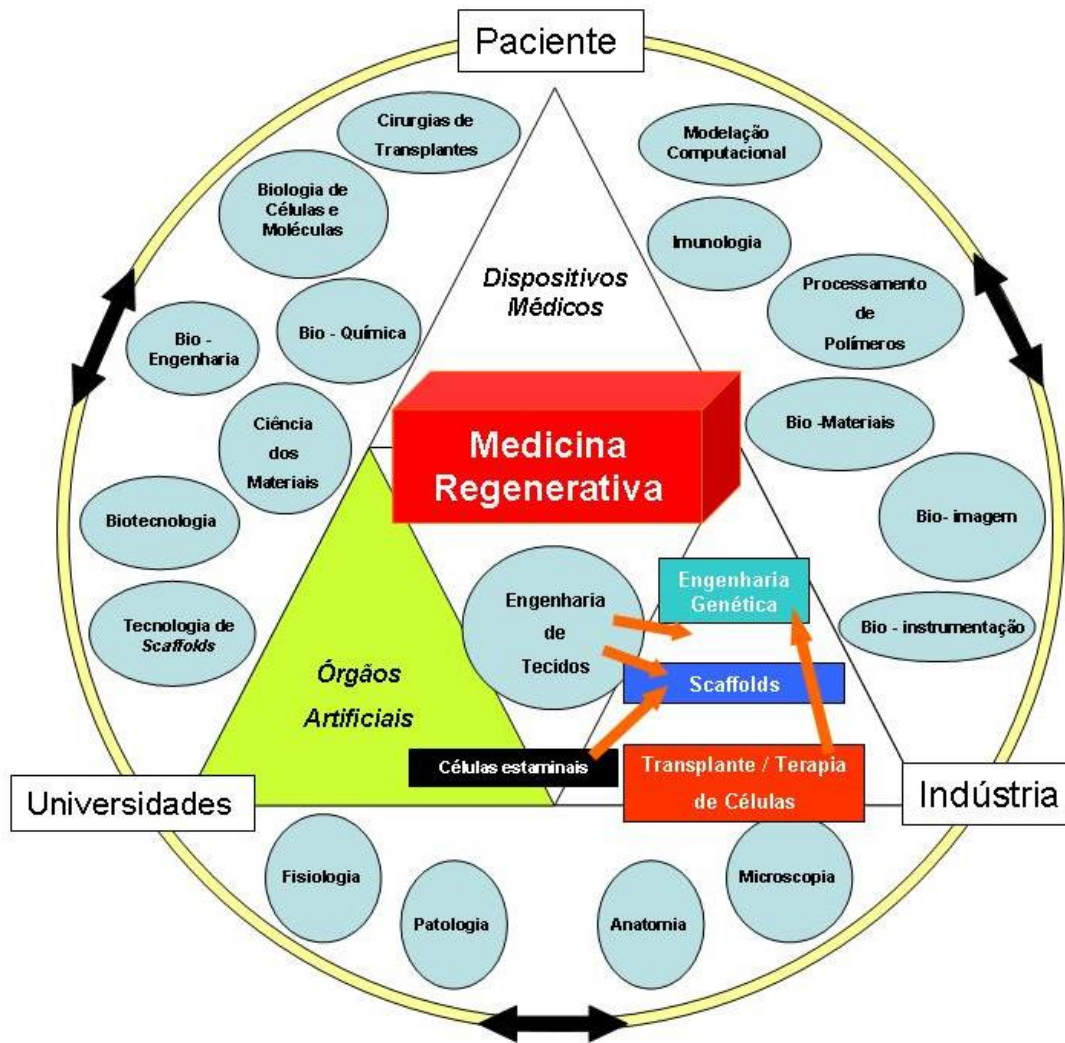
Implantes



Scaffolds

- Conceito de Biofabricação
- Áreas Multidisciplinares:
 - ✓ Engenharias, Física e Química
 - ✓ Saúde (Medicina e Odontologia)
- Integração de Tecnologias

OBJETIVOS E METAS



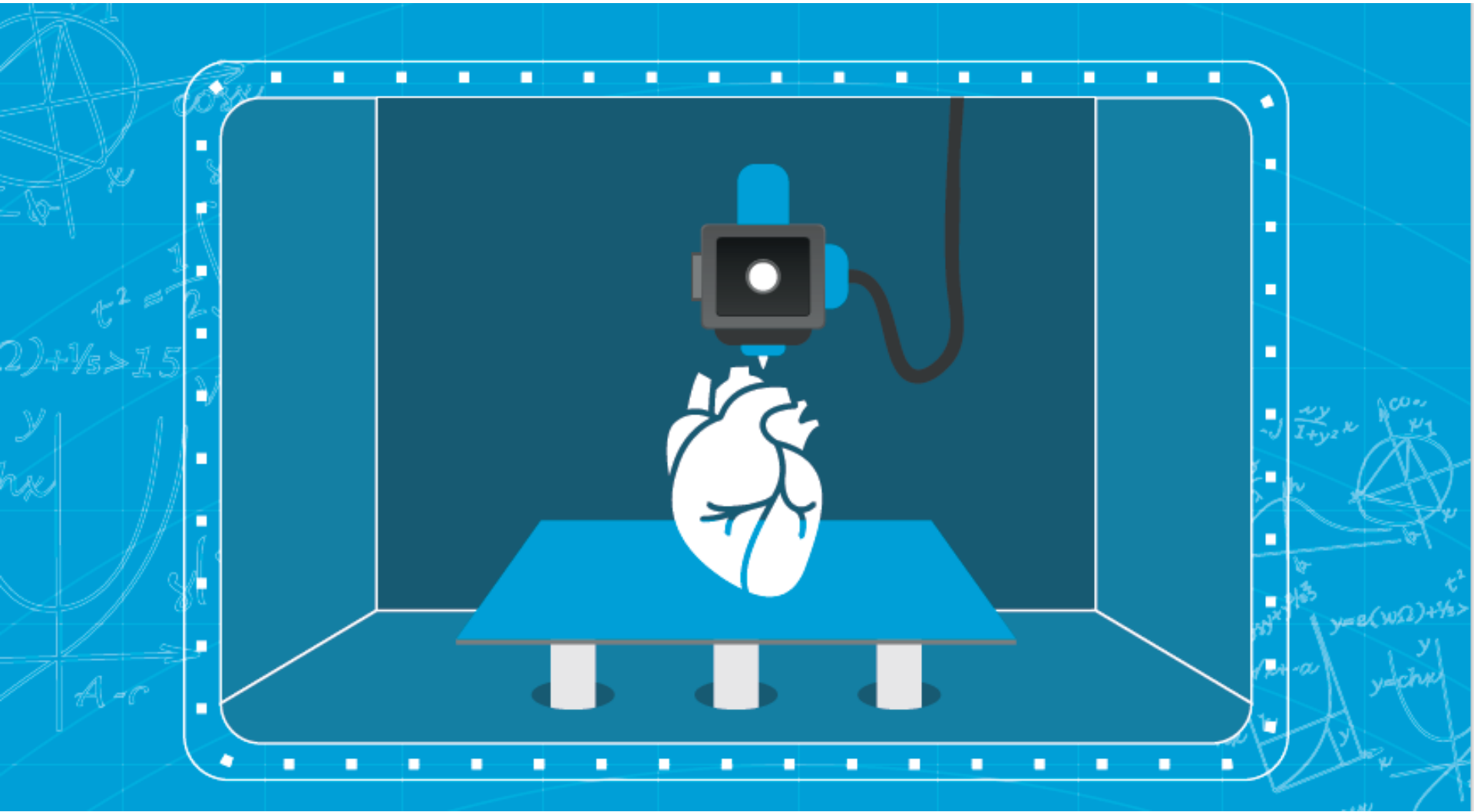
- **Materiais:** avaliação e seleção de materiais (metais, polímeros e cerâmicos) com potencial para aplicação em biofabricação interação material/célula.

- **Técnicas de fabricação:** avaliação das atuais técnicas aditivas de biofabricação (manufatura aditiva) para obtenção de estruturas e dispositivos para aplicações médicas em vários materiais.

- **Simulação computacional:** estudo em software CAD (Computer Aided Design) e CAE (Computer Aided Engineering) e técnicas na utilização de sistemas de tratamento de dados digitais médicos (Tomografia, Ressonância, etc.).

- **Síntese de biomateriais:** síntese e caracterização dos biomateriais quanto às suas propriedades físicas, químicas, mecânicas, e biocompatibilidade *in vitro* e *in vivo*.

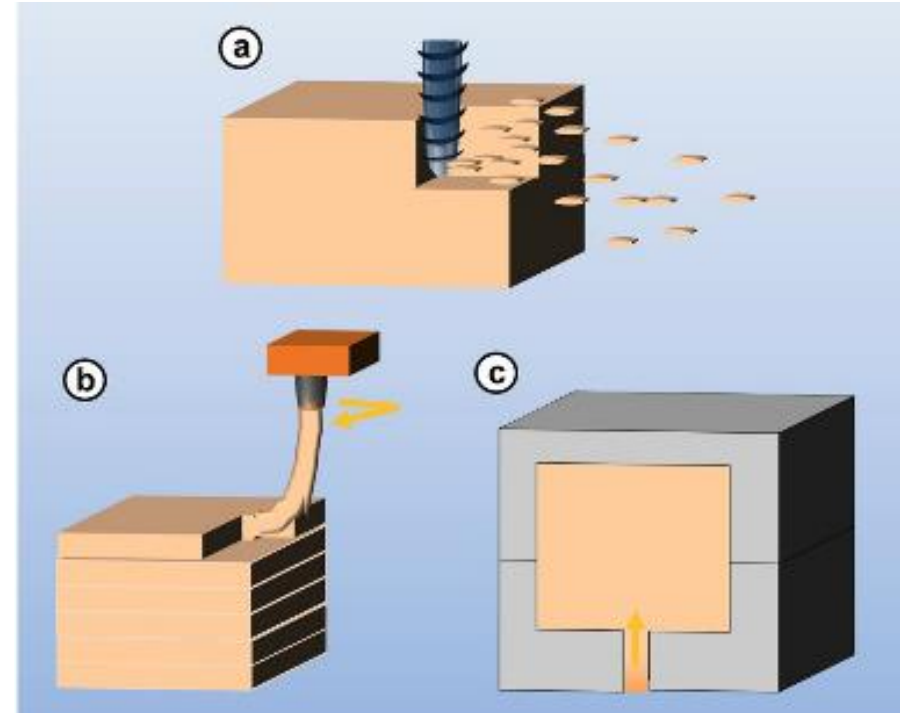
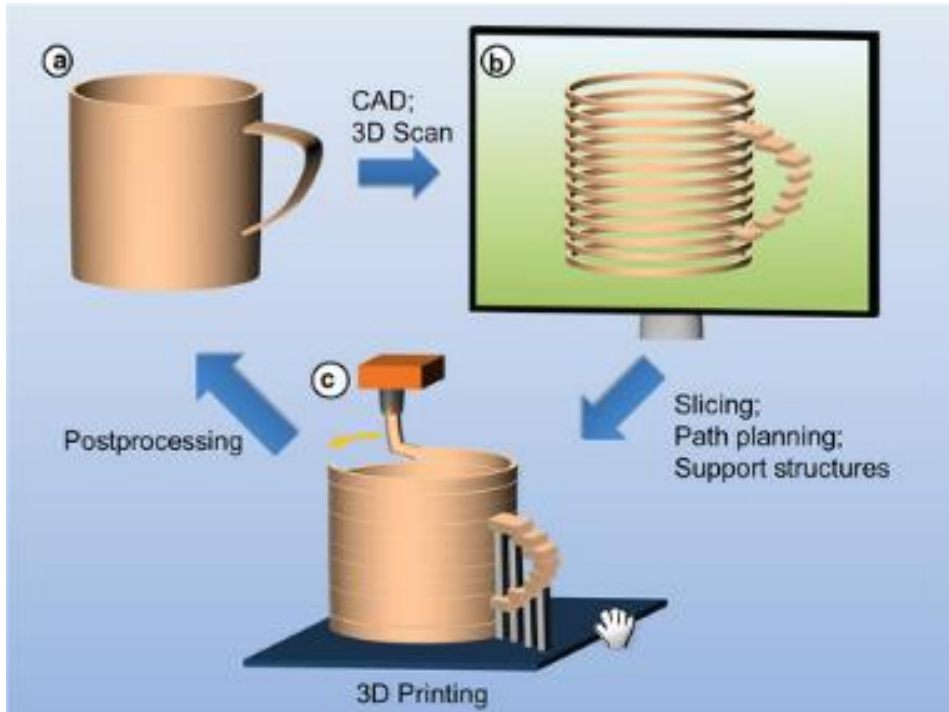
BIO-IMPRESSÃO 3D



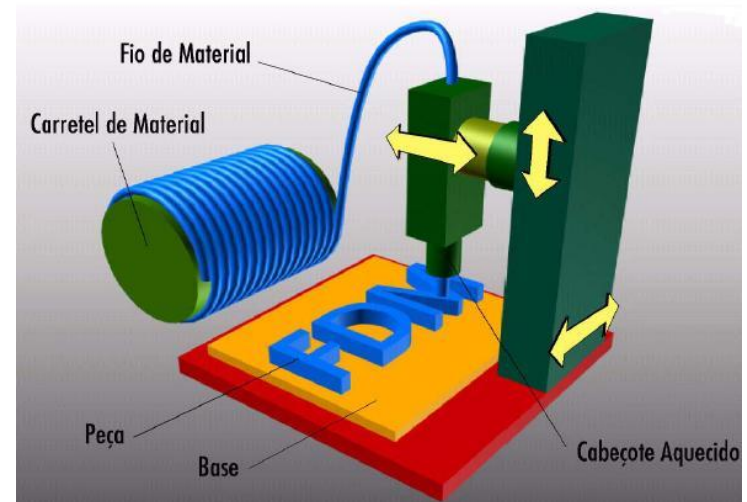
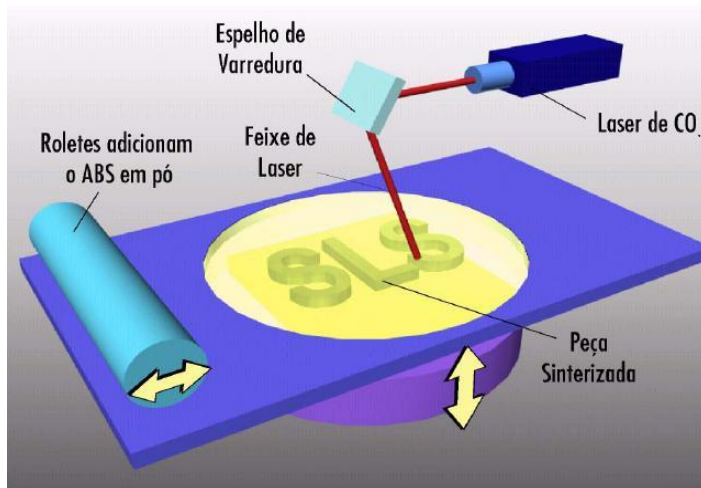
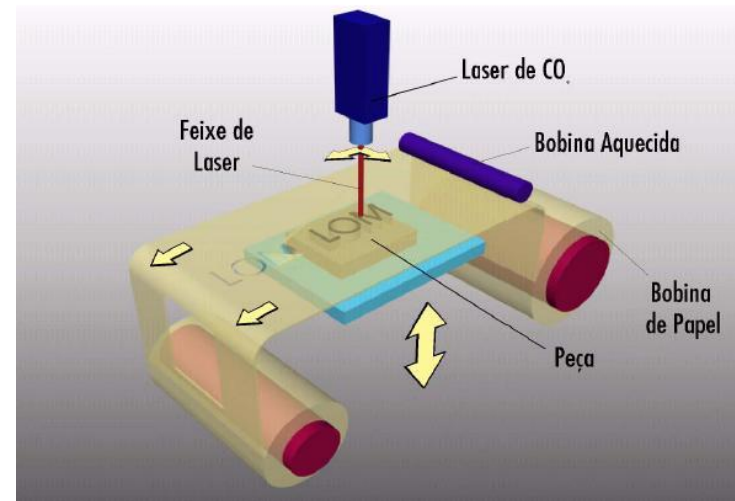
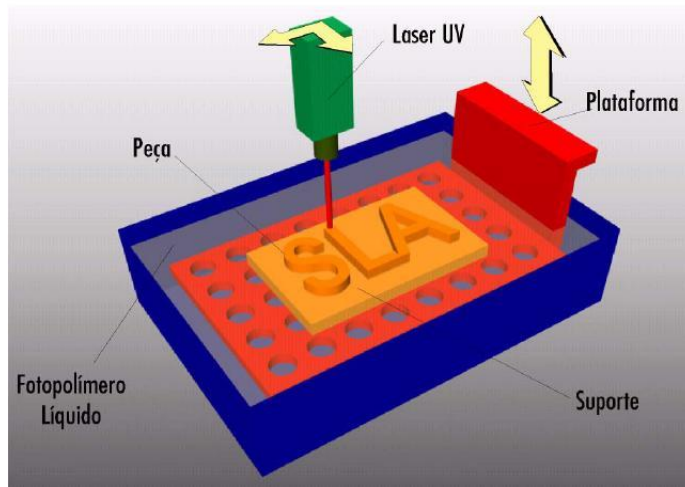
IMPRESSÃO 3D



COMO FUNCIONA A IMPRESSÃO 3D?



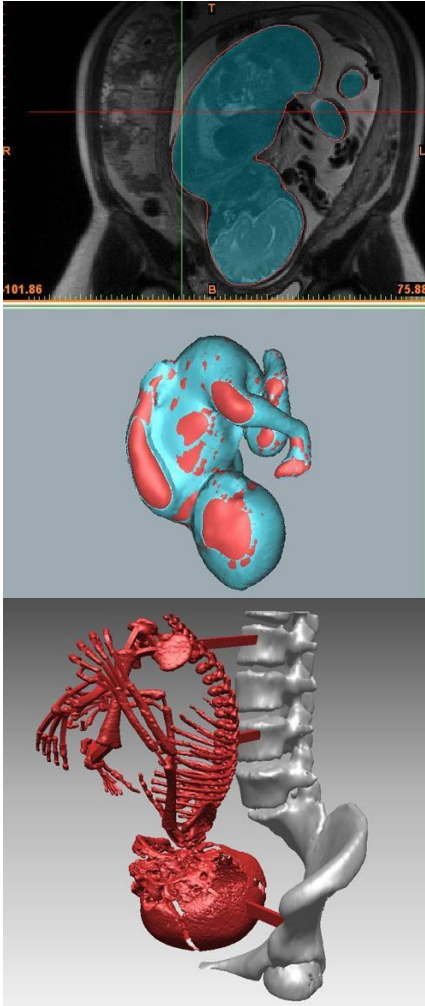
TECNOLOGIAS DE IMPRESSÃO 3D



MULTI-MATERIAIS



APLICAÇÕES - MEDICINA FETAL



APLICAÇÕES - ODONTOLOGIA



Processo Artesanal



Impressão-3D



Implantodontia



Cirurgia Ortognática



Tratamento Ortodôntico

APLICAÇÕES - PERSONALIZAÇÕES

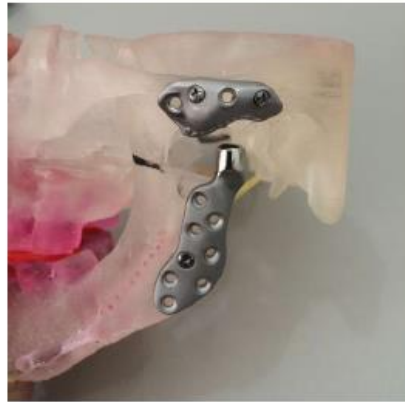
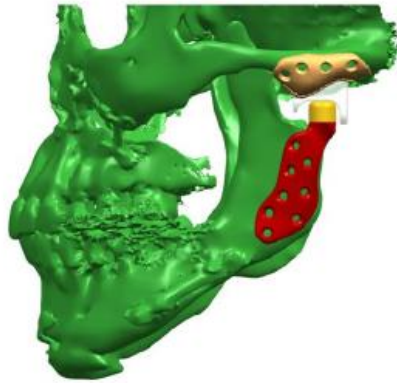


biofabris



NOVAS TENDÊNCIAS

Customização



a)



b)



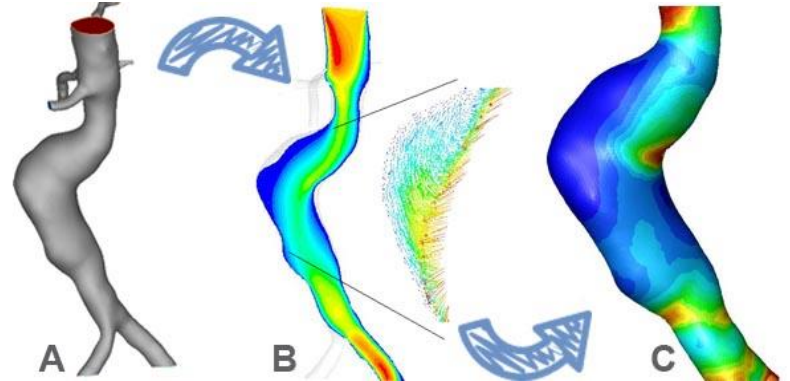
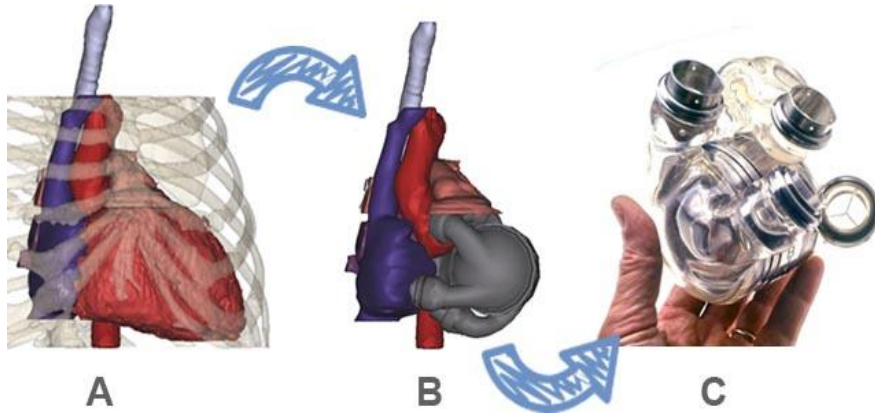
d)



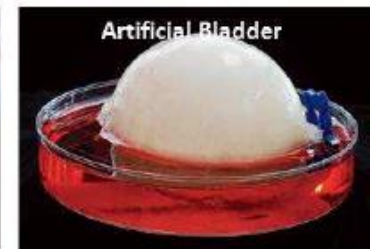
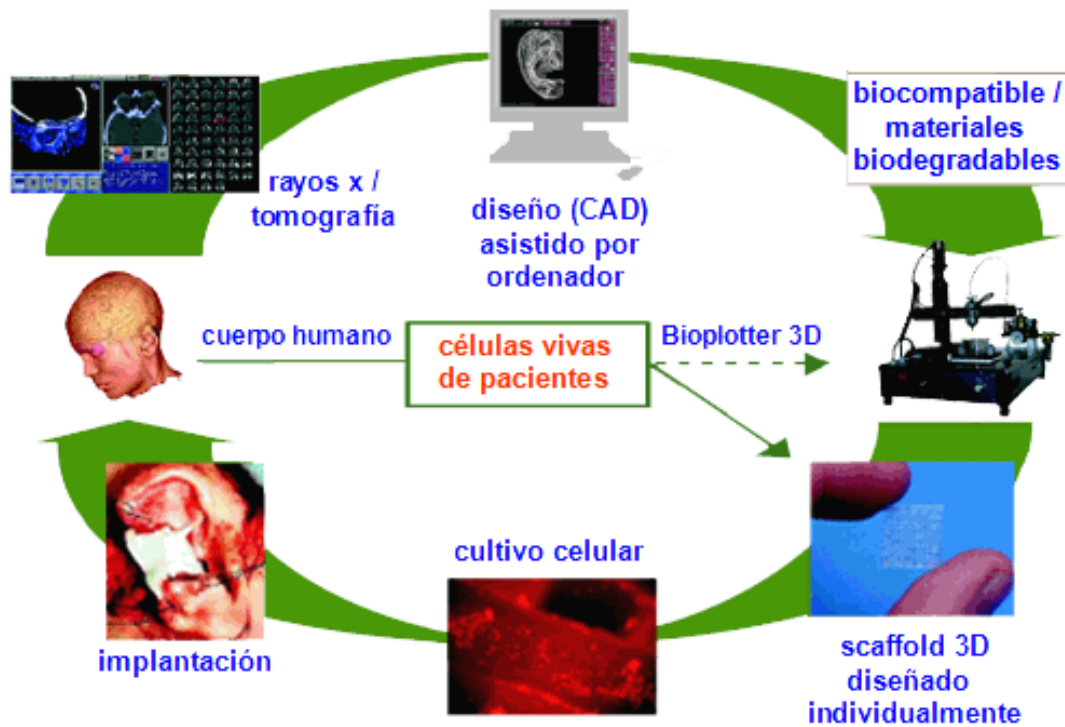
c)



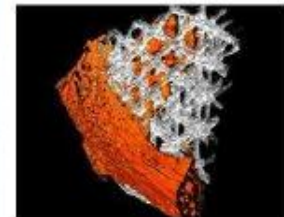
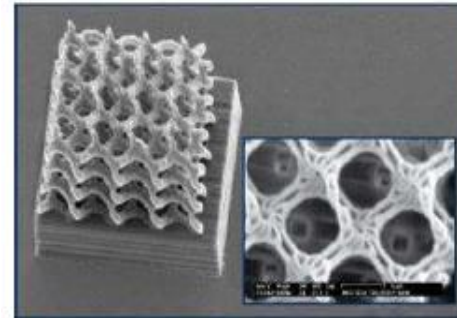
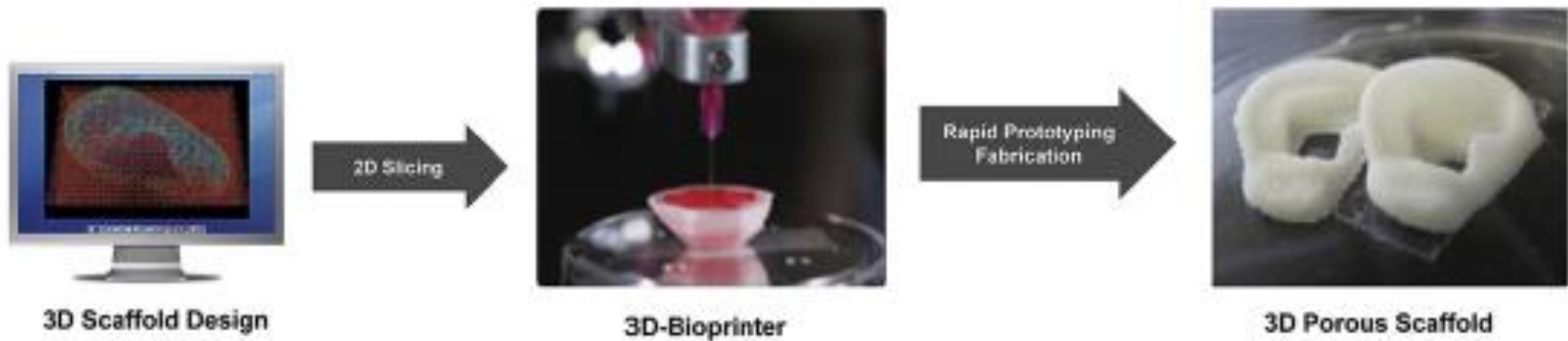
SOFTWARE



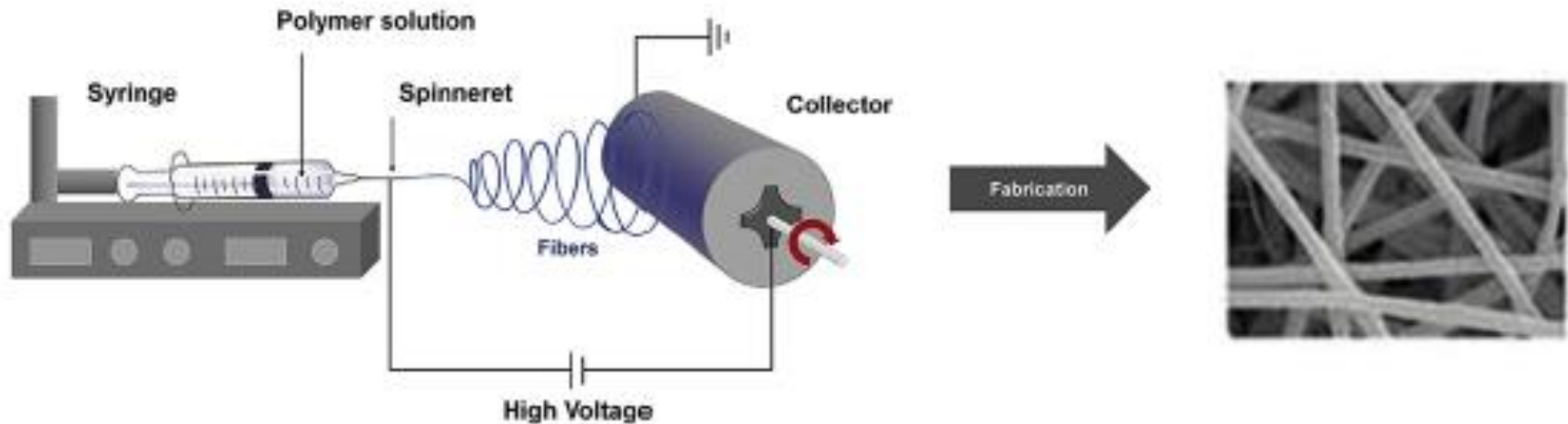
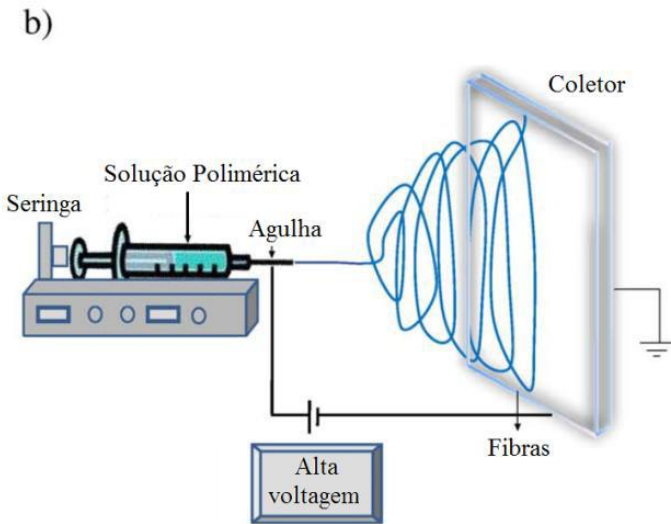
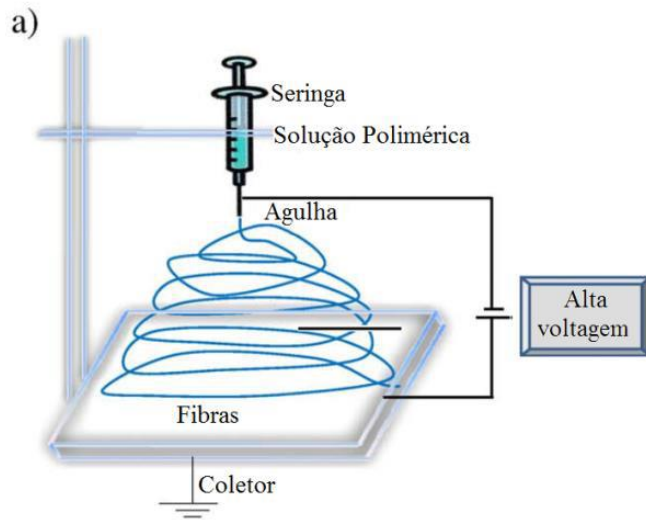
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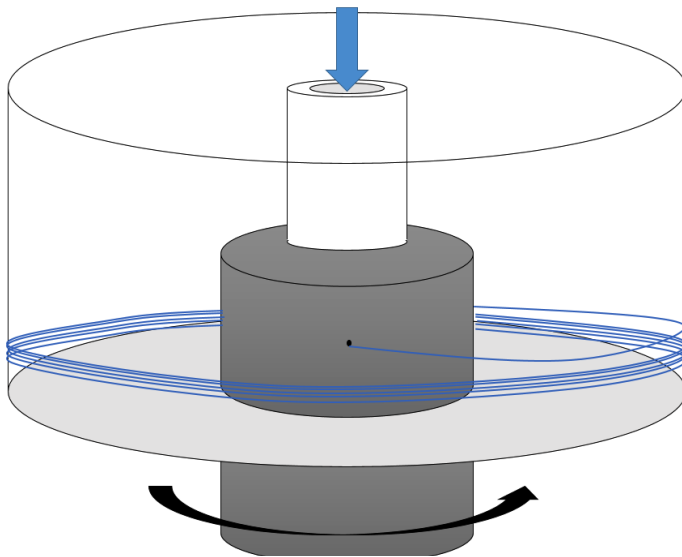
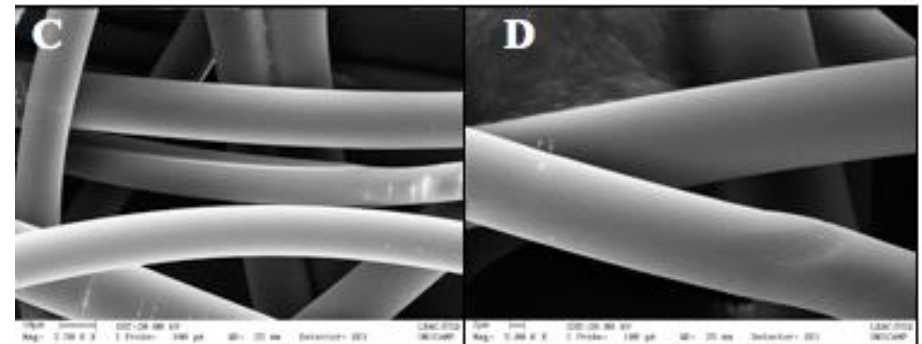
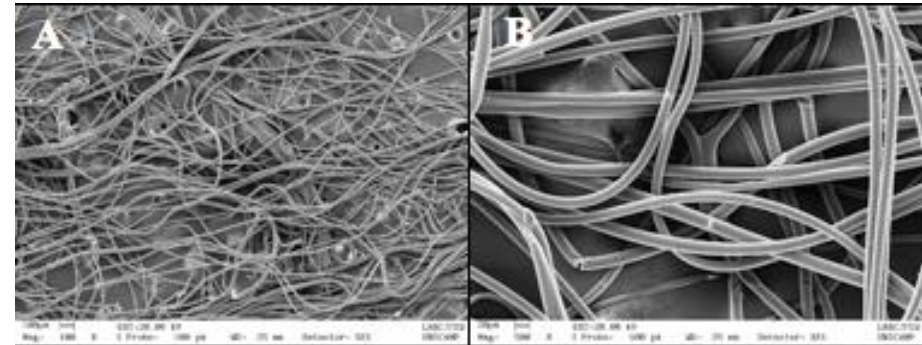
BIOFABRICAÇÃO



BIOFABRICAÇÃO - ELETROFIAÇÃO

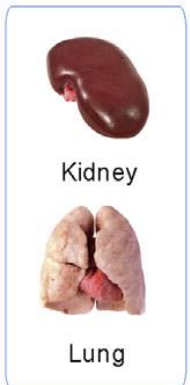


BIOFABRICAÇÃO - ROTOFIAÇÃO



ÓRGÃOS ARTIFICIAIS

Real human organ



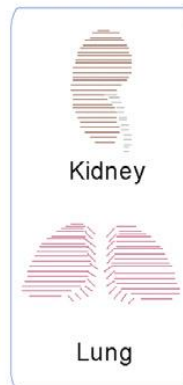
Scanning



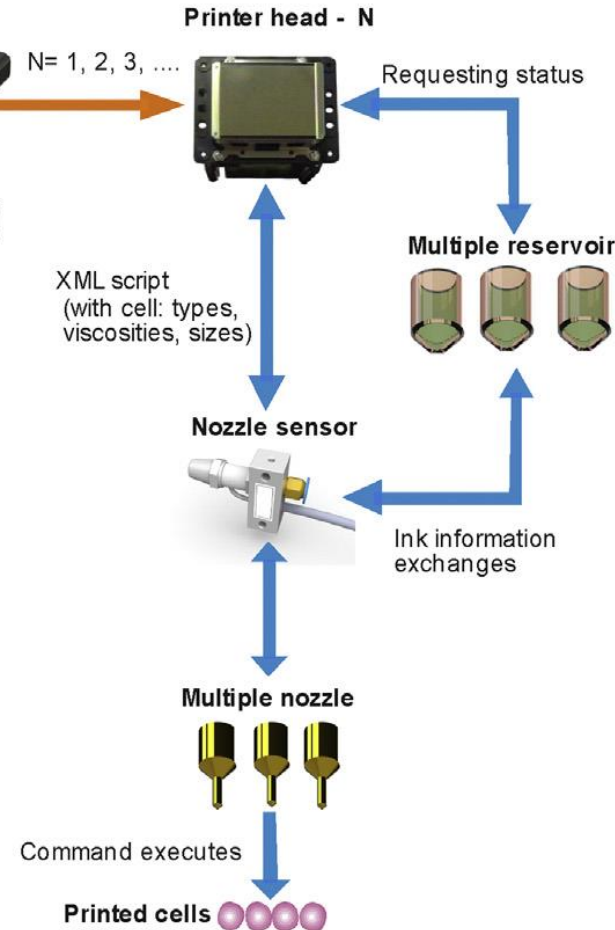
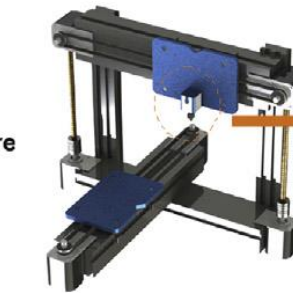
Bio-CAD:
Stryker, MedCAD



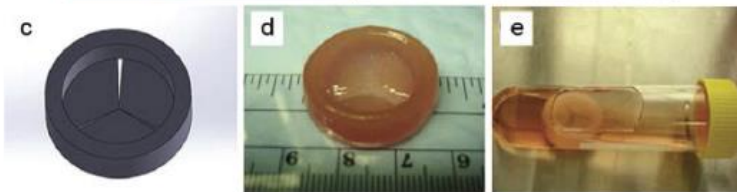
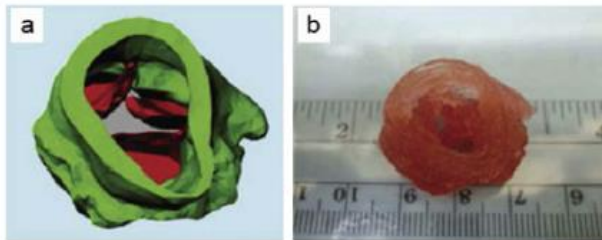
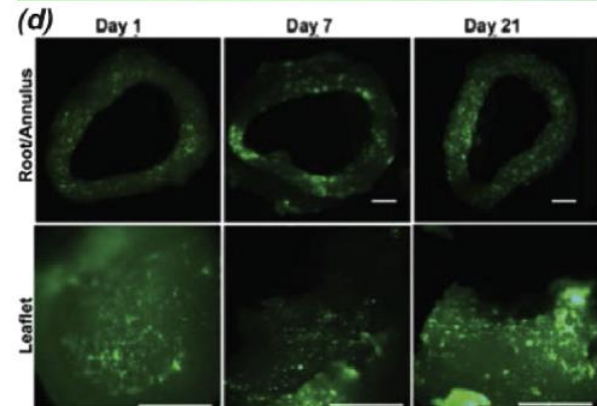
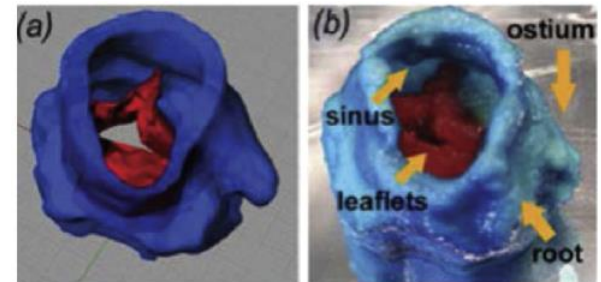
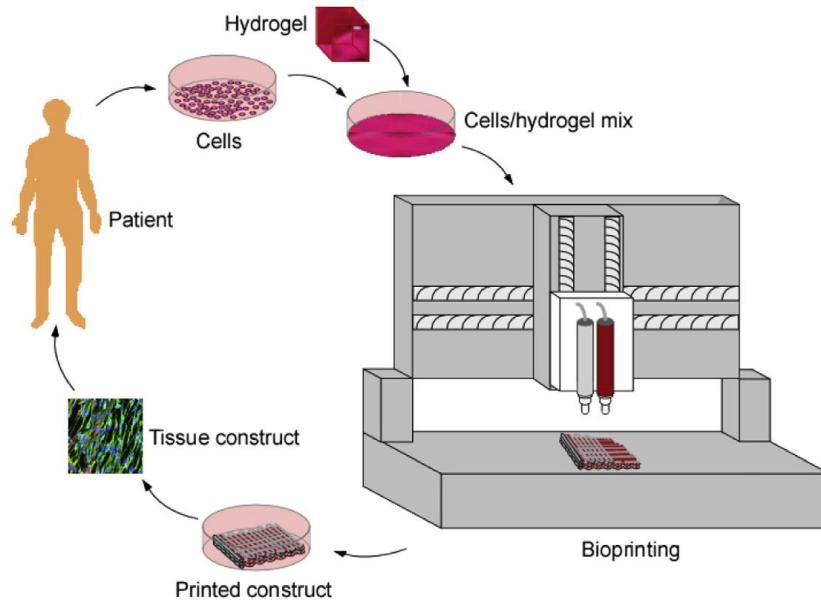
Layered software
RhinoCeros



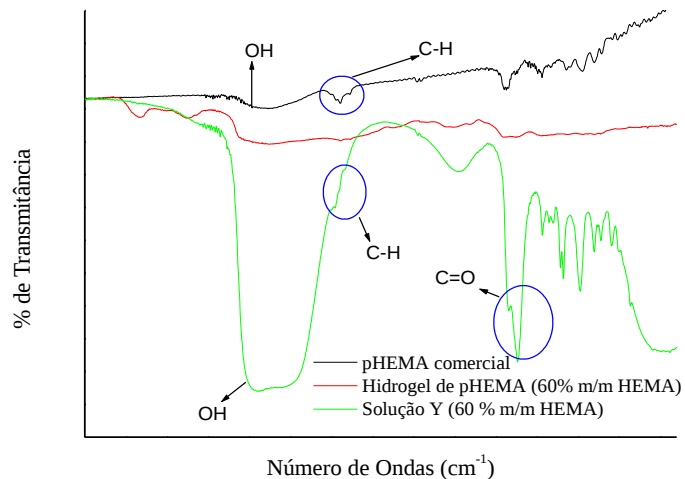
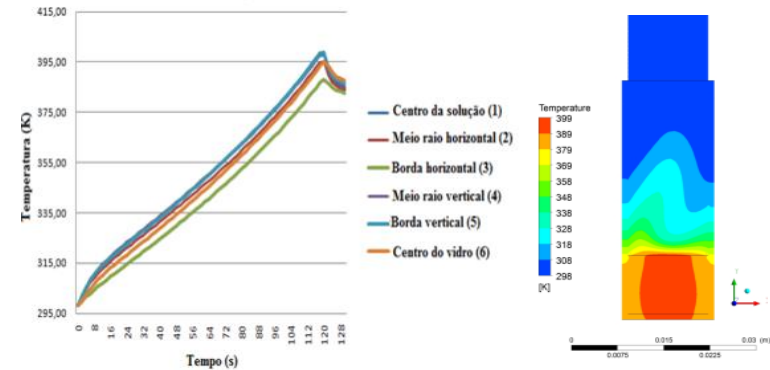
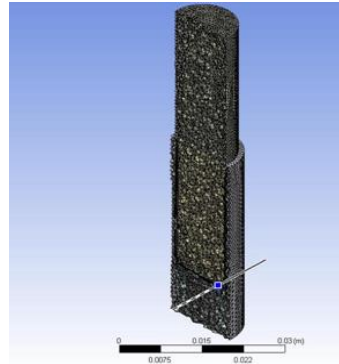
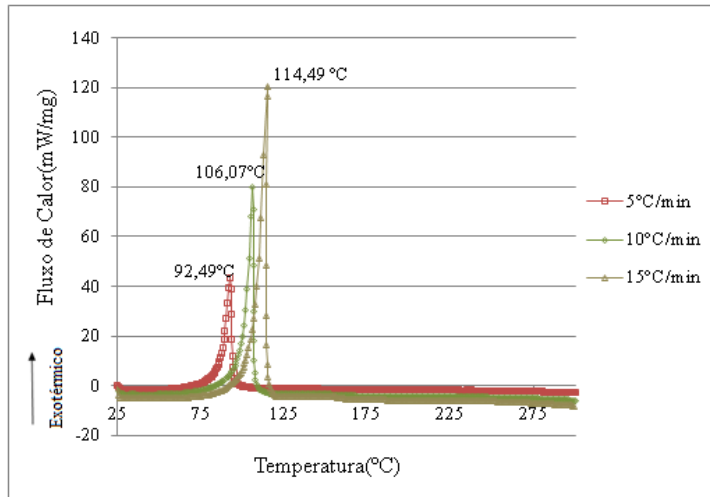
X, Y, Z positioning



ÓRGÃOS ARTIFICIAIS

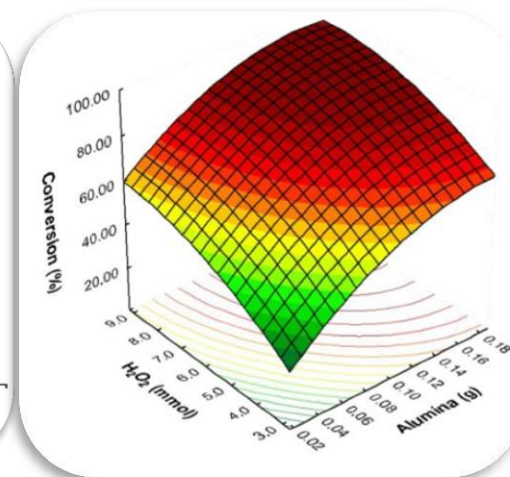
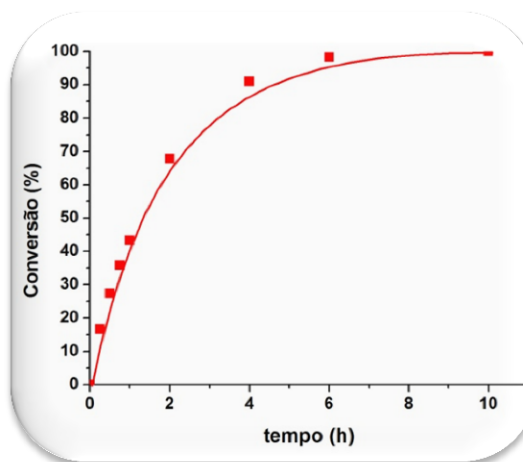
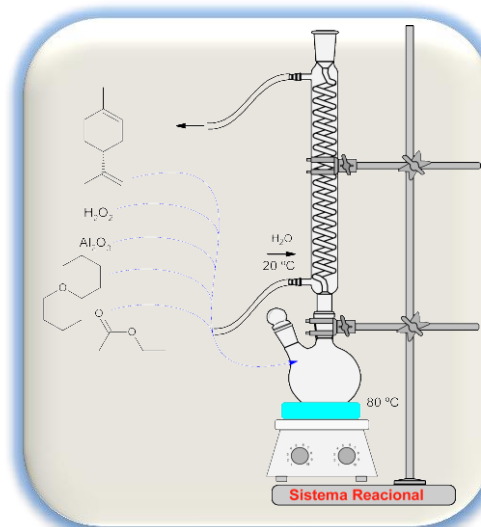


HIDROGEL - PHEMA

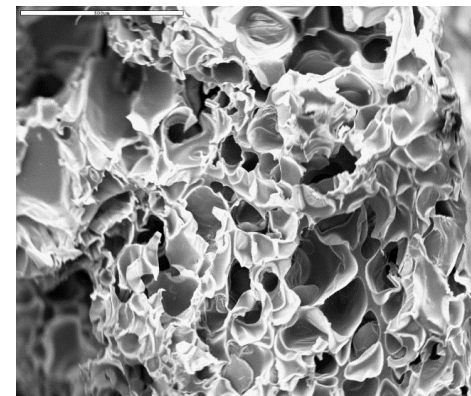
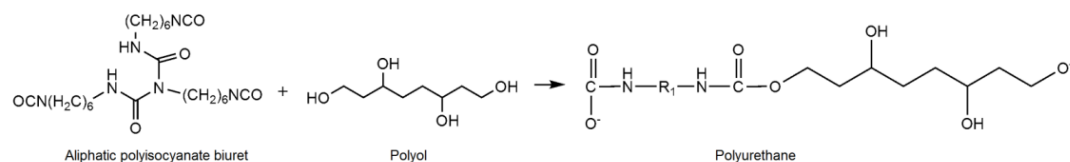
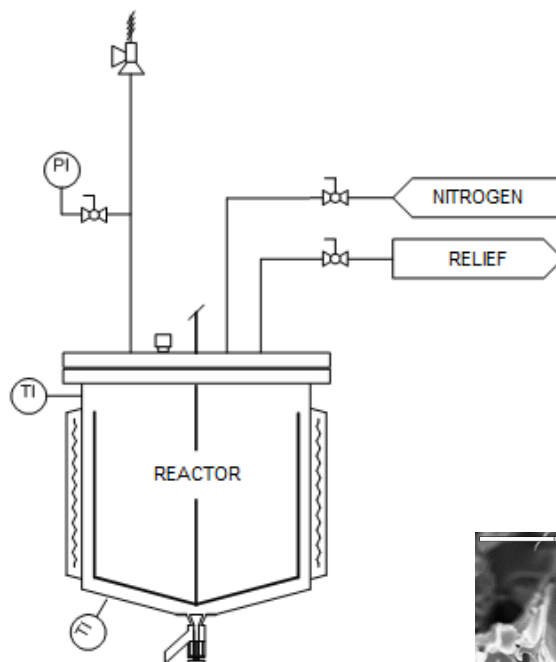


Patente depositada nº: PI 11052970 – Processo de obtenção de biomateriais poliméricos via laser infravermelho.

BIOPOLÍMEROS - LIMONENO

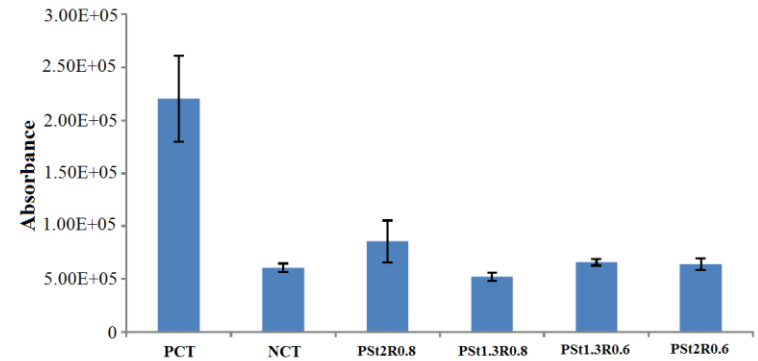
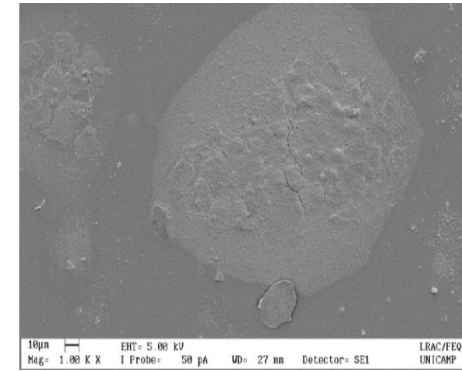
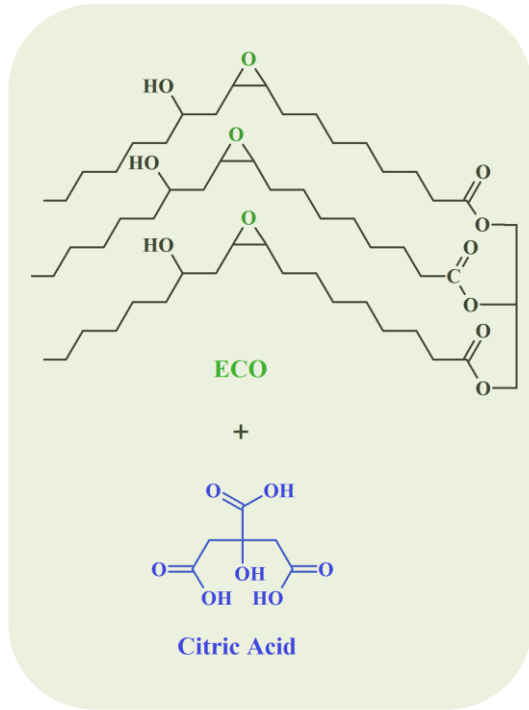


BIOPOLÍMEROS – PU AÇAÍ



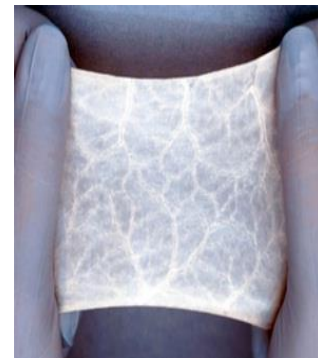
Patente depositada nº: PI 1105296-1 – Poliuretano a base de açaí e uso para biofabricação de dispositivos médicos.

BIOPOLÍMERO – ÓLEO DE MAMONA



In vitro Evaluation

Patente depositada nº: BR 10 2015 006751 8 – Processo de obtenção de poliéster reticulado utilizando processo livre de reagentes tóxicos, poliéster reticulado e uso



BIORREABSORVÍVEIS - PLLA

Tecido Nervoso

Criação de tubos para reconstrução de nervos.



Tecido Cardiovascular

Criação de *stents*, remédios cardíacos e reconstrução de vasos sanguíneos



Tecido Cutâneo

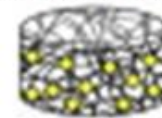
Membranas revestidas com fármacos para aplicação como curativos



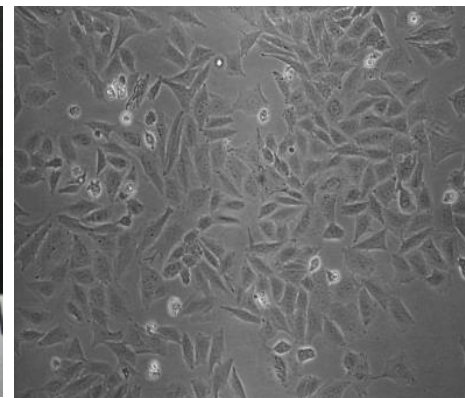
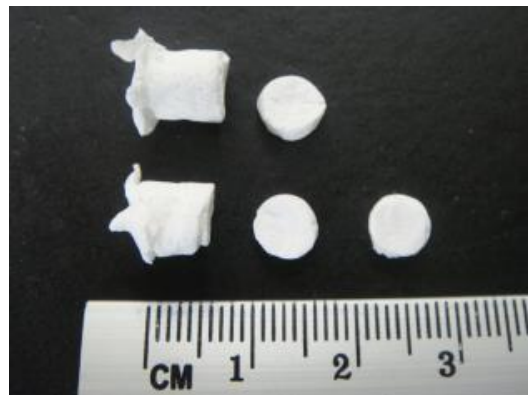
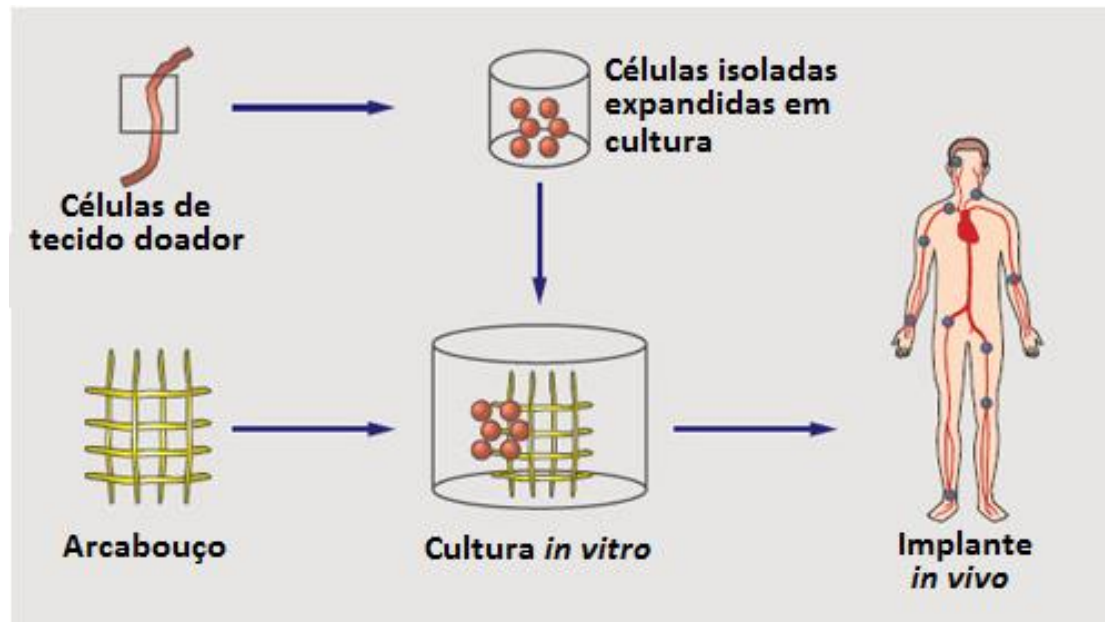
Tecido ósseo e músculo esquelético

Compósitos de PLLA/cerâmicas

Membranas para reparo ósseo e reparo de ligamentos



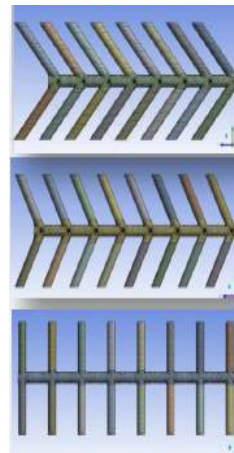
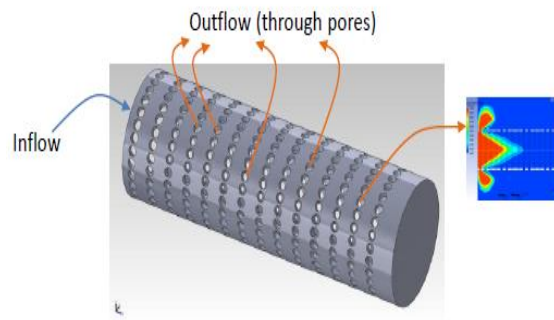
SCAFFOLDS – PLLA+OSTEOBLASTOS



BIOFABRICAÇÃO - BIOREATORES

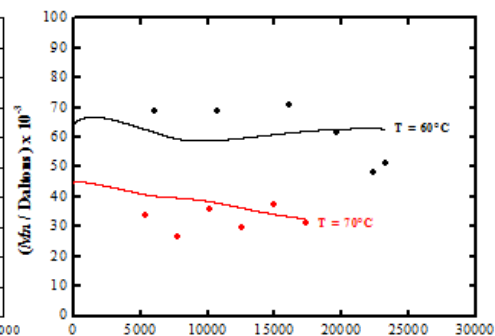
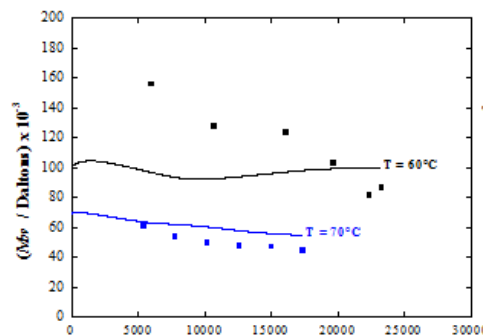
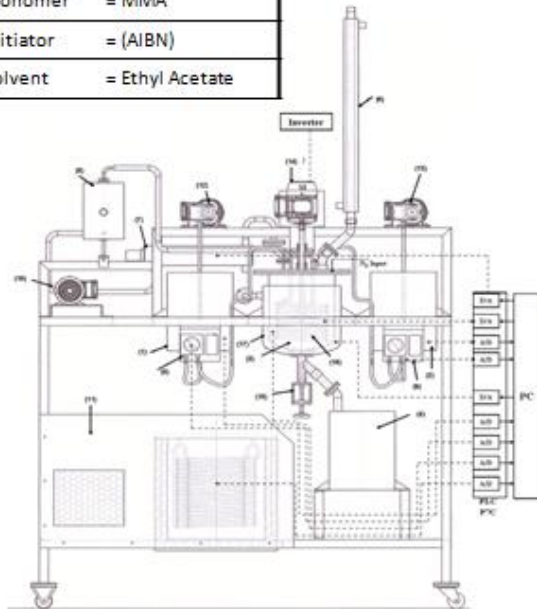


- Fabricação de órgãos
- Parâmetros bioquímicos do processo
- Simulação CFD



OSSO ARTIFICIAL - PMMA

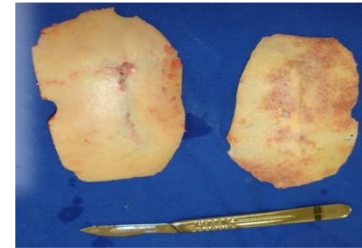
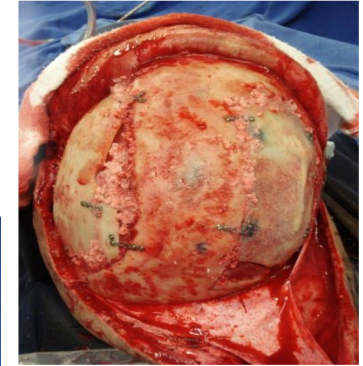
Batch Reactor Mixture	
Monomer	= MMA
Initiator	= (AIBN)
Solvent	= Ethyl Acetate



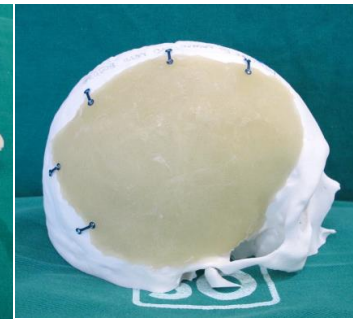
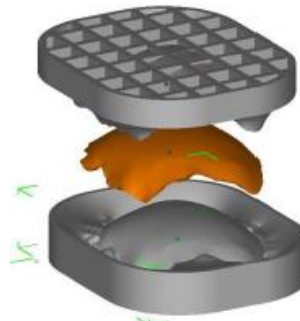
Experimental results compared to the model predictions for the M_n and M_w . Lines are predicted values and the scatters are experimental values. T = temperature.

RECONSTRUÇÃO CRANIANA - PMMA

Técnica Cirúrgica:
Bipartição de calota.



Técnica de Fabricação:
Moldes em MA.



PROJETO PRÓTESE CUSTOMIZADA

Universidade Estadual de Campinas

Faculdade de Engenharia Química

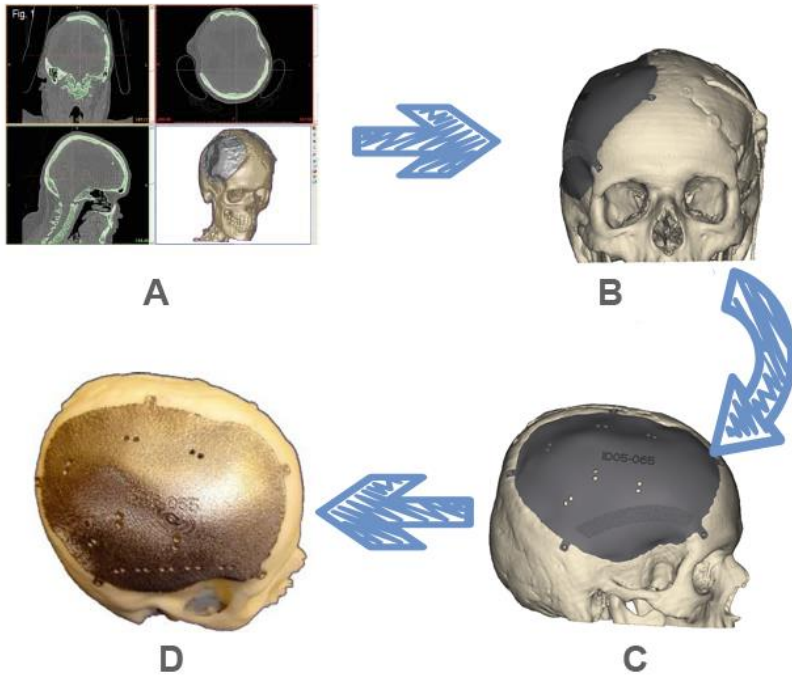
Departamento de Produtos e Processos

- Estudo, caracterização e confecção dos implantes de Ti6Al4V em DMLS supervisionado pelo Prof. Rubens Maciel Filho (coordenador do BIOFABRIS).

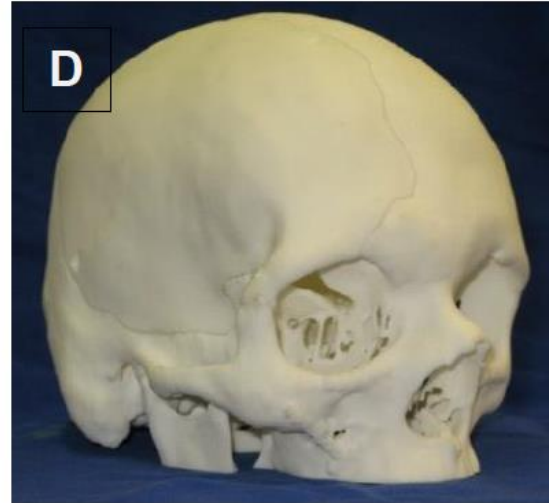
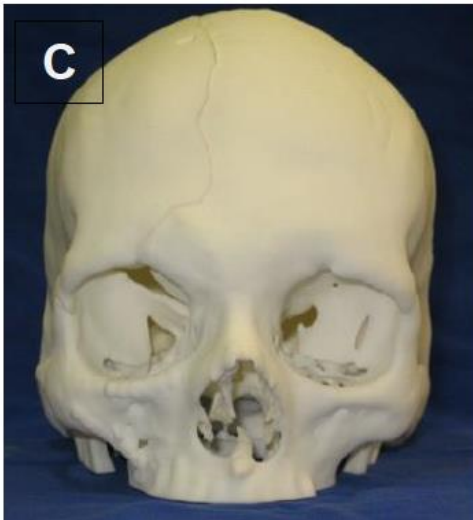
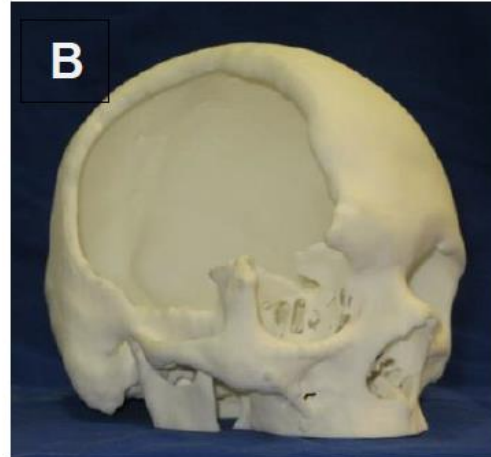
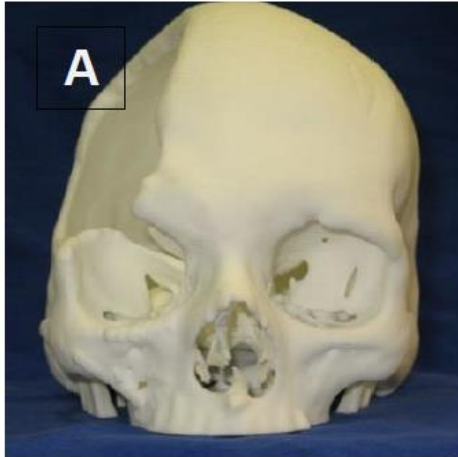
Faculdade de Ciências Médica

Departamento de Cirurgia.

- 10 casos clínicos aprovados no Comitê de Ética em Pesquisa (CEP) e conduzidos pelo Prof. Paulo Kharmandayan (chefe da Cirurgia Plástica).



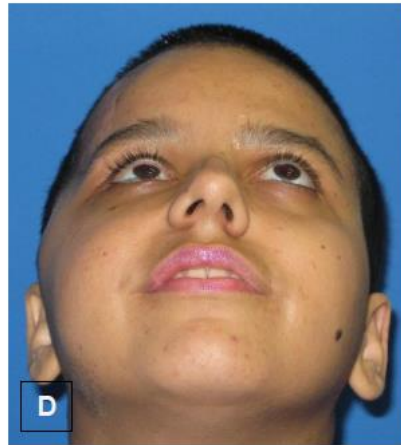
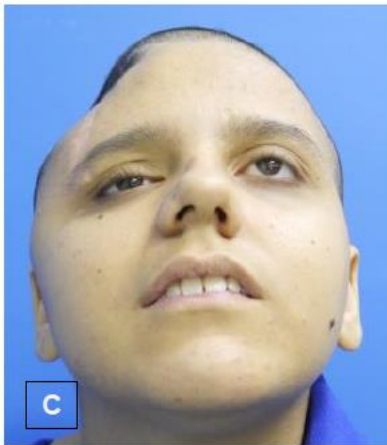
BIOMODELO - POLIAMIDA



- Planejamento Cirúrgico.
- Projeto da prótese.
- Comunicação paciente.
- Esterilização e cirurgia.

IMPLANTE – PACIENTE

- 23 anos de idade
- Acidente motociclístico
- Cirurgia 26/05/2015





감사합니다 Natick
Danke Ευχαριστίες Dalu
Grazie Thank You Köszönöm
Спасибо Dank Tack
谢谢 Merci Gracias
Seé ありがとう
Obrigado

MAIORES INFORMAÇÕES:

E-mail: contato@biofabris.com.br

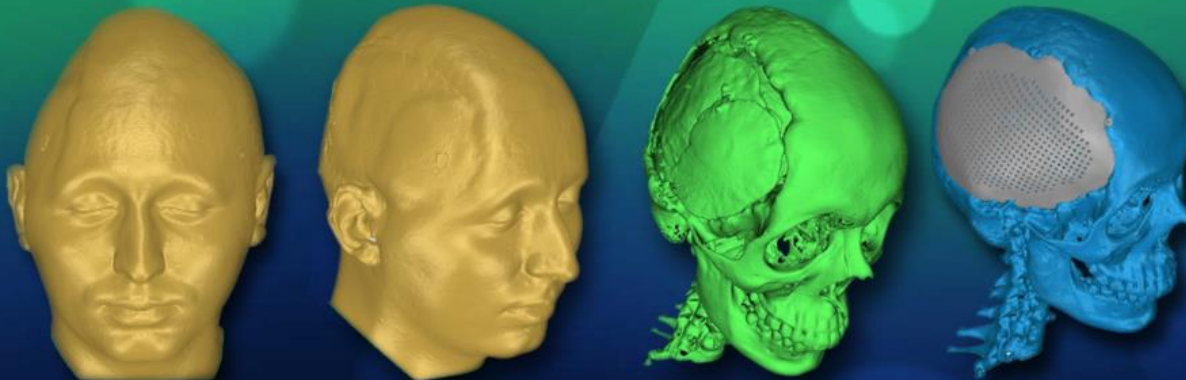
Portal: www.biofabris.com.br



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