

novel biomimetic strategy for bone regeneration



InnovaBone Final Conference

14 October 2015

Noemi Baruch

Promoscience

NetScience: a case study of how European funding allows to create tools for a smooth running of scientific experiments



InnovaBone is a project funded by the EC under the Seventh Framework Programme (NMP.2010.2.3-1)
Grant agreement no: 263363



we design. we code. we promote.

CRAFTING COMMUNICATION & DIGITAL SOLUTIONS to boost your project



we design. we code. we promote.

competences

**Infographics design / Web design
/ Logo design / Video production
/ Animation production / Media
Liaison / Application development
/ DataBase implementation /
Market analysis / Technology
assesment / Project management
/ Graphic design /
Copywriting**

tools

**Photoshop / Javascript /
InDesign /
/ Illustrator / AfterEffects / C# /
Business Insights /
JS / CSS / Bootstrap / SQL /
AngularJS / Premiere /
Thompson innovation /**

we **design.** we **code.** we **promote.**

a web solution
for collaborative projects

net**science**


an integrated platform for:
Document | Project | Content
management.


netscience as a content management system





netscience as a document management system


netscience

 Lifecycle System

 Dashboard

 Work Packages

 Documents Repository

 Send Email

Files

Meetings

2nd meeting















kick off meeting


Presentations

add folder

add file

You are in: files / meetings / kick off meeting / presentations

NAME	MODIFIED	SIZE
 ELASTISLET_Welcome.pdf	Jul 15, 2015 06:48 PI	2.25 MB
 P01 - UVa Partner Presentation- E...	Jul 16, 2015 11:09 AI	1.65 MB
 P02 - UMINHO Partner Presentati...	Jul 16, 2015 10:53 AI	4.50 MB
 P03 - HUJI Partner Presentation - ...	Jul 16, 2015 10:53 AI	1.32 MB
 P04 - MUW Partner Presentation - ...	Jul 16, 2015 10:54 AI	806 KB
 P05 - Basel University Partner Pre...	Jul 16, 2015 10:54 AI	2.43 MB
 P06 - UPe Partner Presentation- E...	Jul 16, 2015 10:54 AI	3.07 MB
 P07 - PROMOSCIENCE Partner Pre...	Jul 16, 2015 10:54 AI	587 KB
 P08 - TPNBT Partner Presentation...	Jul 16, 2015 10:59 AI	1.04 MB
 P09 - Axiogenesis Partner Present...	Jul 16, 2015 10:54 AI	1.32 MB
 P10 - ASPHALION Partner Present...	Jul 16, 2015 10:54 AI	2.40 MB
 P11 - UUH Partner Presentation- ...	Jul 16, 2015 10:54 AI	1.02 MB
 WP01 - ELASTISLET PROJECT MAN...	Jul 16, 2015 11:01 AI	624 KB
 WP02 - ELASTISLET - UVa.pdf	Jul 16, 2015 11:01 AI	711 KB

 **P07 - PROMOSCIENCE Partner Presentation- ELASTISLE.pdf**

FILE

P07 - PROMOSCIENCE Partner Presentation- ELASTISLE.pdf

FILE SIZE

0.6 MB


FILE HISTORY


■


Added by SA on 16/07/2015

LINK


<http://intranet.elastislet.eu/DashBoard.aspx?folderHas>


 delete


 modify


 download


PERMISSIONS ▲







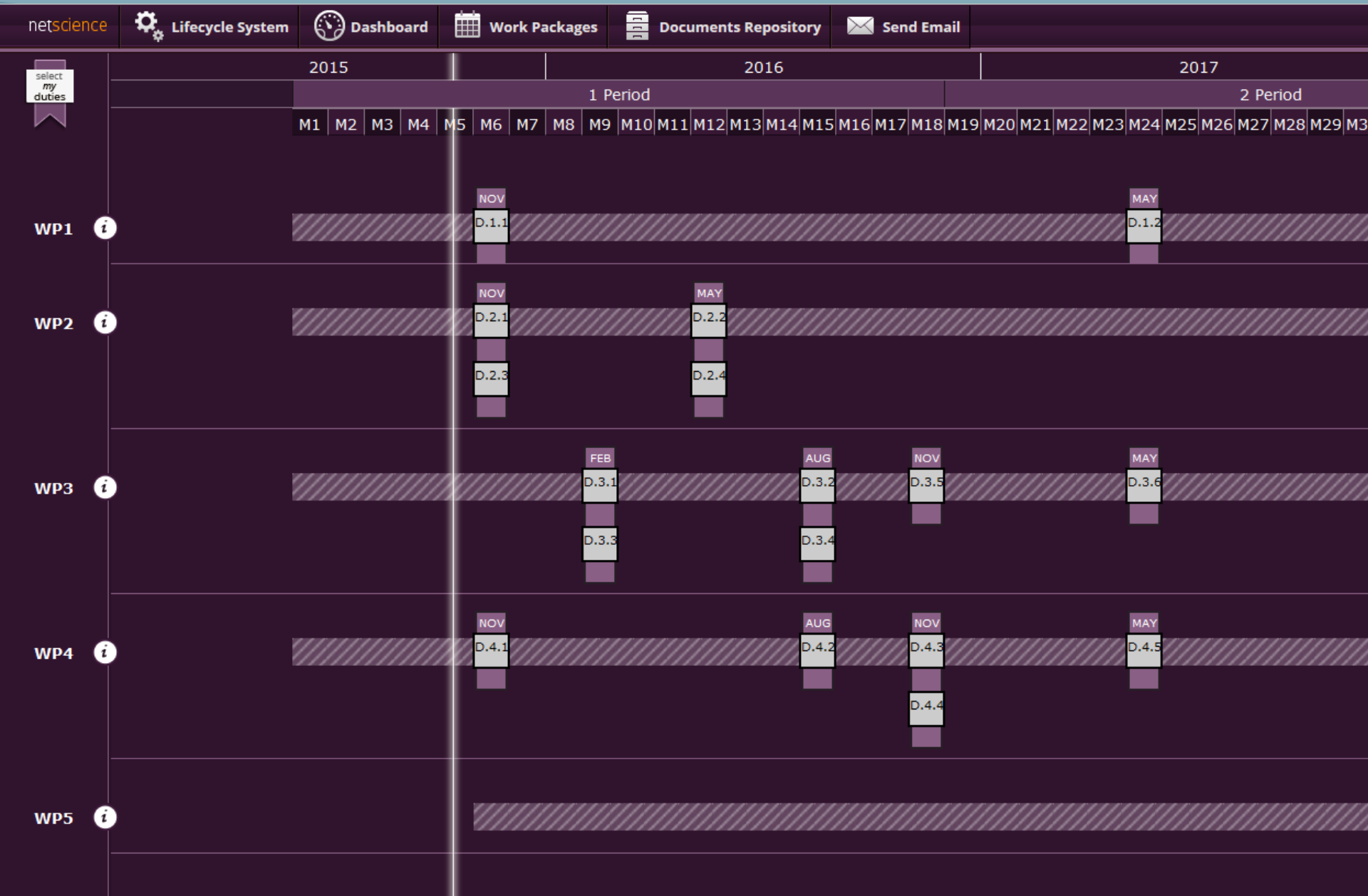




FULL CONTROL

Baruch N., Brancaleon R., SA

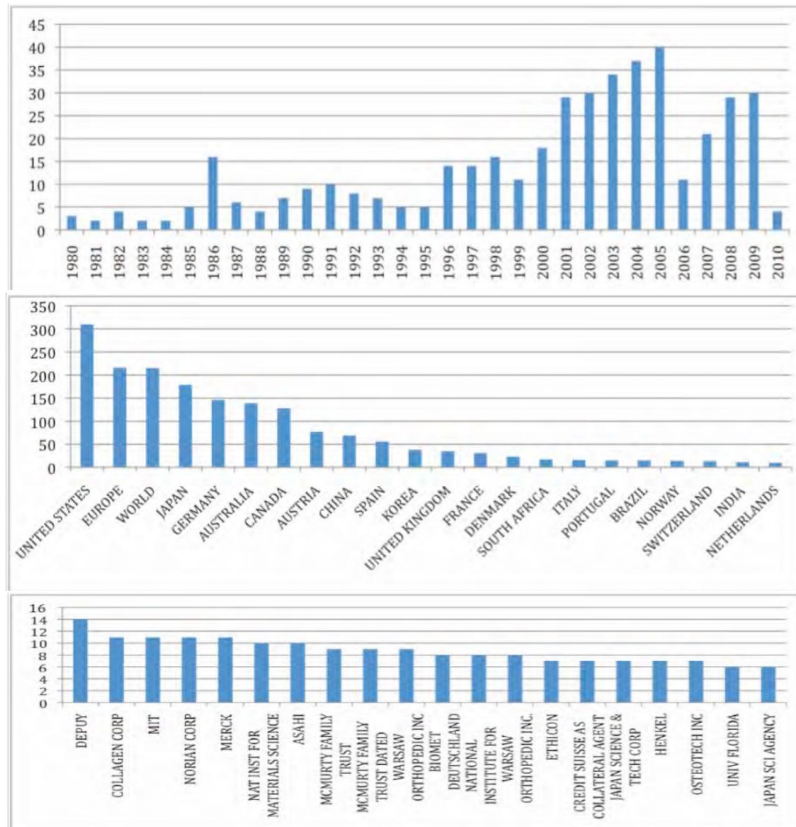
netscience as a project management system



netscience as conference web site



IB as a case study | design phase



short range

medium to long range

scientific and clinical

INNOVATIVE SCIENTIFIC & TECHNICAL RESEARCH GOING FAR BEYOND THE STATE OF THE ART

- 1 creation of an innovative 2-step biomaterial treatment
- 2 elucidating cellular and molecular pathways involved in bone cell response to biomaterials

NEW KNOWLEDGE WITH A HIGH PROSPECT FOR POTENTIAL APPLICATIONS

- 1 innovative biomaterial technology tested with in vivo and in vitro models
- 2 novel diagnostic biomarkers that indicate whether bone healing is progressing sufficiently in the patient
- 3 potential patents

TECHNOLOGY COMMERCIALISATION OPPORTUNITIES

- 1 new product responding to specific medical needs in the growing orthopaedics market
- 2 substances ready for testing in clinical phase I/II clinical trials
- 3 regulatory strategy in place in order to accelerate market introduction

MEDICAL APPLICATIONS

- 1 biomimetic material with simple logistics, no disease transmission, unlimited availability
- 2 substitution of bank bone or autologous bone
- 3 clear advantages on existing products e.g. Infuse™

DISSEMINATION

- 1 scientific knowledge spreading
- 2 technologic dissemination
- 3 social awareness

economic

CONTRIBUTION TO SUBSTANTIAL INNOVATIONS IN THE EUROPEAN INDUSTRY

- 1 New Laser Technology for the upscaling of the scaffold production
- 2 expedite commercialisation and produce a prototype
- 3 allow industrial partners to enhance the EU biotech profile with innovative and marketable technologies

4 increase in job availability

5 training of young scientists

EUROPEAN APPROACH

- 1 increased profile of European Science
- 2 knowledge exchange with national and international research activities
- 3 attract foreign researchers for a more competitive ERA

SOCIAL ISSUES & GENDER ASPECTS

- 1 alleviate the strain of a big public health concern, driven by the increase in the elderly population and their desire to remain active
- 2 gender sensitive approach with high impact on both genders

IB as a case study | implementation phase

novel biomimetic strategy for bone regeneration



[SIGN OUT](#) | [CHANGE PASSWORD](#)

[THE PROJECT](#)

[CONSORTIUM](#)

[NEWS](#)

[CONTACT US](#)



the
objectives

ensuring healthy and strong **bone regeneration**
reducing patients' pain
associated with bone lesions



our
workplan

developing optimally performing **bioinspired biomaterials** mimicking the natural physiological processes underlying bone repair



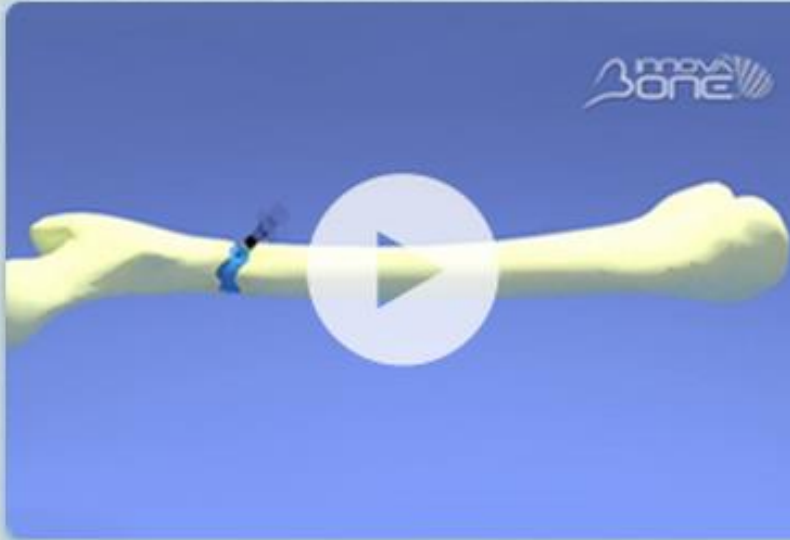
expected
results

smart bioactive biomaterials fitting within the lesions and recruiting the body's cells **to reconstruct the bone**



expected
impacts

a radical innovation in state-of-the-art to address the morbidity and mortality of bone lesions



Tackling non-healing bone lesions

Watch the video to find out our way



At the leading edge of regenerative medicine

Download the project leaflet illustrating our strategy



Biomaterials in



2 | Overview

Overview

TREATMENT OF BONE SPACERS POSES GREAT CHALLENGES
 Bone spacers have long been used to fill the gap between two vertebrae after the removal of a disc. They are made of various materials, including polymers, ceramics, and metals. However, the use of bone spacers is still limited due to the risk of infection and the need for a second surgery to remove them.

Traditionally, bone spacers are made of polymers, which are easy to handle and can be shaped into various forms. However, they often lack the mechanical strength and biocompatibility required for long-term use. Ceramic spacers, on the other hand, offer better mechanical properties but are more difficult to handle and may cause inflammation. Metal spacers provide the highest mechanical strength but are also associated with a higher risk of infection.

By now, most medical professionals know that it is among the most difficult tasks to design a bone spacer. Most manufacturers and designers focus on the mechanical properties of the spacer, but they often neglect the biological aspects. The increasing complexity of the design and the need for a second surgery to remove the spacer are major challenges. However, the increasing complexity of the design and the need for a second surgery to remove the spacer are major challenges.

Discussion
 The purpose of this analysis was to identify the most relevant patents in the field of orthobiologics and to provide a comprehensive overview of the current state of the art. The results of the analysis are presented in the following sections.

IB as a case study | **implementation phase**

TOOLS AND METHODS FOR:

Manage logistics

Trace materials

Compare results

Reenact experiments

DATA MANAGEMENT

SAMPLE LIFECYCLE MANAGEMENT SYSTEM



new process

20/11/'13



ABC sent you 10 ml of ABC012.C
sterilized gel with microparticles

got it

15/10/'13



DEFG sent you 20 # of DEFG01.a
scaffolds

got it

SCAFFOLDS (3mm)

ACME001.A



(DEFG005.A + QWER001.B) > ACME001.A

processed on 18/02/2013 by R.Brancaleon (ACME)



15 of 30 of 45
YOURS AVAILABLE PRODUCED

Sterilization of
Scaffolds(3mm) of
LCM(4)

type of sterilization gamma ray 3

parameter 2aX number

lorem ipsum 3 Lorem ipsum dolor sit amet,
consectetur adipiscing elit, sed do
eiusmod tempor incididunt



used for ⓘ send ↗ +

Osteoblast differentiation

ABC003



(ABC005.A + ZWKY001.B) > ABC003

processed on 18/02/2013 by J.Smith (ABC)

.A .B .C

Test of Sterilization of Scaffolds(2mm)
of LCM(1)



1 immune cell proliferation 312

2 apoptosis live/dead cell ratio 20%

citoxylene profile type A

3 lorem ipsum 5



used for ⓘ send ↗ +

SCAFFOLDS (3mm)

DEFG005.A

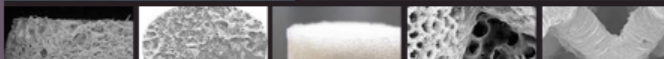


(PS007.D > DEFG005.A

processed on 18/02/2013 by P.TeTomi (DEFG)



Scaffolds(3mm) of
LCM(4)



DISKS (5mm)

UNOTT001.A



(IBA005.A + UNIVIE001.B) > UNIVIE003

processed on 18/02/2013 by R.Brancaleon (UNOTT)



Disks (5mm)
of LCM(3)

filters

apply filters

clear filters

☐ hide not available

Materials

☐ LCM

☐ DISKS

☒ SCAFFOLDS

☐ towers

☐ calvaria

☐ cylinders

Improvements

new process

20/11/'13

ABC sent you 10 ml of ABC012.C
sterilized gel with microparticles

got it

15/10/'13

DEFG sent you 20 # of DEFG01.a
scaffolds

got it

SCAFFOLDS (3mm)

ACME001.A

(DEFG005.A + QWER001.B) > ACME001.A

processed on 18/02/2013 by R.Brancaleon (ACME)

Sterilization of
Scaffolds(3mm) of

Osteoblast differentiation

ABC003

(ABC005.A + ZWKY001.B) > ABC003

processed on 18/02/2013 by J.Smith (ABC)

.A

.B

.C

filters

☐ his

Mat

☐ LC

☐ DIS

☐ SCAFFOLDS

☐ towers

☐ calvaria

☐ cylinders

Improvements

20/11/'13

UNOTT sent you 20# of UNOTT003
Gamma Sterilization of Disks (5mm) of LCM(3)

got it

lorem ipsum 3

lorem ipsum dolor sit amet,
consectetur adipisicing elit, sed do
eiusmod tempor incididunt

1

used for

send

1	2	3
1	immune cell proliferation	312
2	apoptosis live/dead cell ratio	20%
	citoxyne profile	type A
3	lorem ispum	5
3		
	used for	send

SCAFFOLDS (3mm)

DEFG005.A

(PS007.D > DEFG005.A

processed on 18/02/2013 by P.TeTomi (DEFG)



Scaffolds(3mm) of
LCM(4)



DISKS (5mm)

UNOTT001.A

(IBA005.A + UNIVIE001.B) > UNIVIE003

processed on 18/02/2013 by R.Brancaleon (UNOTT)

#

Disks (5mm)
of LCM(3)



new process

15/10/'13



DEFG sent you 20 # of DEFG01.a scaffolds

got it

60# DISKS (5mm)

UNOTT003

IBA005 > IBA007 > UNOTT003

processed on 18/02/2013 by Y.Klarc (UNOTT)



20
YOURS

40
OTHERS'

Gamma Sterilization
of **Disks (5mm)**
of **LCM(3)**

CSEM
20
#

UNOTT
10
#

MUW
10
#

CSEM
10
#

UMG
5
#

UNIVIE
5
#

compare



used for



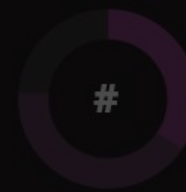
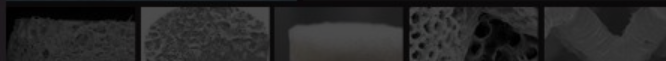
send



more details



LCM(4)



Disks (5mm)
of **LCM(3)**



new process

UNOTT003 Gamma Sterilization

type of sterilization gamma ray

radiation Cobalt 60

notes and comments 10s for 3 times
ISO 11137:

IBA007 2PP scaffold production



photoinitiator BA740

wt% 0.1

disc size - diameter 4mm

IBA005 LCM (3)

Methacrylation degree (%) 80

Molecular weight (g/mol) 1670

LA:CL ratio 14:8

compare

used for

send

less details -

of DEFG01.a

got it

tion

ABC003

ABC003

3 by J.Smith (ABC)

tion of Scaffolds(2mm)



on 312

ell 20%

to

ile type A

m 5

used for

send



UNOTT001.A

UNIVE003

13 by R.Brancaleon (UNOTT)

Disks (5mm)
of LCM(3)



new process

filters

clear filters

☐ hide not available

Materials

☐ LCM

☐ DISKS

☒ SCAFFOLDS

☐ towers

☐ calvaria

☐ cylinders

Improvements

60# DISKS (5mm)

UNOTT003

IBA005 > IBA007 > UNOTT003

processed on 18/02/2013 by Y.Klarc (UNOTT)



Gamma Sterilization
of Disks (5mm)
of LCM(3)

20
YOURS

40
OTHERS'

CSEM
20
#

UNOTT
10
#

MUW
10
#

CSEM
10
#

UMG
5
#

UNIVIE
5
#

UNOTT003 Gamma Sterilization

type of sterilization gamma ray

radiation Cobalt 60

notes and comments 10s for 3 times
ISO 11137:

IBA007 2PP scaffold production



photoinitiator BA740

wt% 0.1

disc size - diameter 4mm

IBA005 LCM (3)

Methacrylation degree (%) 80

Methacrylation degree (%) 1678

15/10/'13



IBA sent you 40# of IBA005
scaffolds of LCM(6)

got it

Osteoblast differentiation

UNIVIE003

(IBA005.A + UNIVIE001.B) > UNIVIE003

processed on 18/02/2013 by R.Brancaleon (UNOTT)

.A .B .C

Test of Sterilization of Scaffolds(2mm)
of LCM(1)



1 immune cell proliferation 312

2 apoptosis live/dead cell ratio 20%

cytoxyne profile type A

3 lorem ipsum 5



compare

used for

send

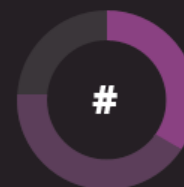


45# SCAFFOLDS (5x3x5mm)

UNOTT001.A

(IBA005.A + UNIVIE001.B) > UNOTT001.A

processed on 18/02/2013 by R.Brancaleon (UNOTT)



Sterilization of
Scaffolds(3mm) of
LCM(4)



new process

filters

clear filters

☐ hide not available

Materials

☐ LCM

☐ DISKS

☒ SCAFFOLDS

☐ towers

☐ calvaria

☐ cylinders

Improvements

Dynamic force test

CSEM009

IBA005 > IBA007 > UNOTT003 > CSEM009

processed on 18/02/2013 by M.Giazzon (CSEM)



download

Dynamic force in
bioreactor with 3D
model of Gamma
Sterilization of Disks
(5mm) of LCM(3)

flow rate (ml/min) 200

cell concentration (n/ml) 1.5x10E6

cell types hMSCs

amplitude of force (nN) 0.5

frequency of force (Hz) 2

signal type sinusoidal

pre-incubation time (h) 24h in cell medium

incubation time (week) 3 in bioreactor

description and notes

Test the 2 bioreactors (constant force and with the motor) with cells during 3 weeks. The motor worked 6 hours /day during working days. Histology will be used for analysis

compare



used for



send



more details -

60# DISKS (5mm)

UNOTT003

IBA005 > IBA007 > UNOTT003

processed on 18/02/2013 by Y.Klarc (UNOTT)

15/10/'13



IBA sent you 40# of IBA005
scaffolds of LCM(6)

got it

Osteoblast differentiation

UNIVIE003



(IBA005.A + UNIVIE001.B) > UNIVIE003

processed on 18/02/2013 by R.Brancaleon (UNOTT)

.A

.B

.C

Test of Sterilization of Scaffolds(2mm)
of LCM(1)



1 immune cell proliferation 312

2 apoptosis live/dead cell ratio 20%

cytoxyne profile type A

3 lorem ipsum 5



compare



used for



send



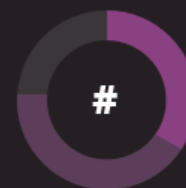
45# SCAFFOLDS (5x3x5mm)

UNOTT001.A



(IBA005.A + UNIVIE001.B) > UNOTT001.A

processed on 18/02/2013 by R.Brancaleon (UNOTT)



Sterilization of
Scaffolds(3mm) of
LCM(4)



new process

Dynamic force test

CSEM009

IBA005 > IBA007 > UNOTT003 > CSEM009

processed on 18/02/2013 by M.Glazzon (CSEM)



download

Dynamic force in
bioreactor with 3D
model of Gamma
Sterilization of Disks
(5mm) of LCM(3)

flow rate (ml/min) 200

cell concentration (n/ml) 1.5x10E6

cell types hMSCs

amplitude of force (nN) 0.5

frequency of force (Hz) 2

signal type sinusoidal

pre-incubation time (h) 24h in cell medium

incubation time (week) 3 in bioreactor

description and notes

Test the 2 bioreactors (constant force and with the motor) with cells during 3 weeks. The motor worked 6 hours /day during working days. Histology will be used for analysis

compare used for send more details +

IBA sent you 40# of IBA005
scaffolds of LCM(6)

got it

teoblast differentiation

UNIVIE003

(IBA005.A + UNIVIE001.B) > UNIVIE003

processed on 18/02/2013 by R.Brancaleon (UNOTT)

.B .C

test of Sterilization of Scaffolds(2mm)
LCM(1)



immune cell proliferation 312

apoptosis live/dead cell
ratio 20%

citoxylene profile type A

lorem ipsum 5

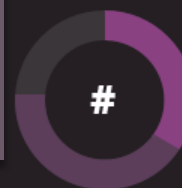
compare used for send +

SCAFFOLDS (5x3x5mm)

UNOTT001.A

(IBA005.A + UNIVIE001.B) > UNOTT001.A

processed on 18/02/2013 by R.Brancaleon (UNOTT)



Sterilization of
Scaffolds(3mm) of
LCM(4)

InnovaBone has boosted Promoscience competitiveness

THANK YOU!!!!