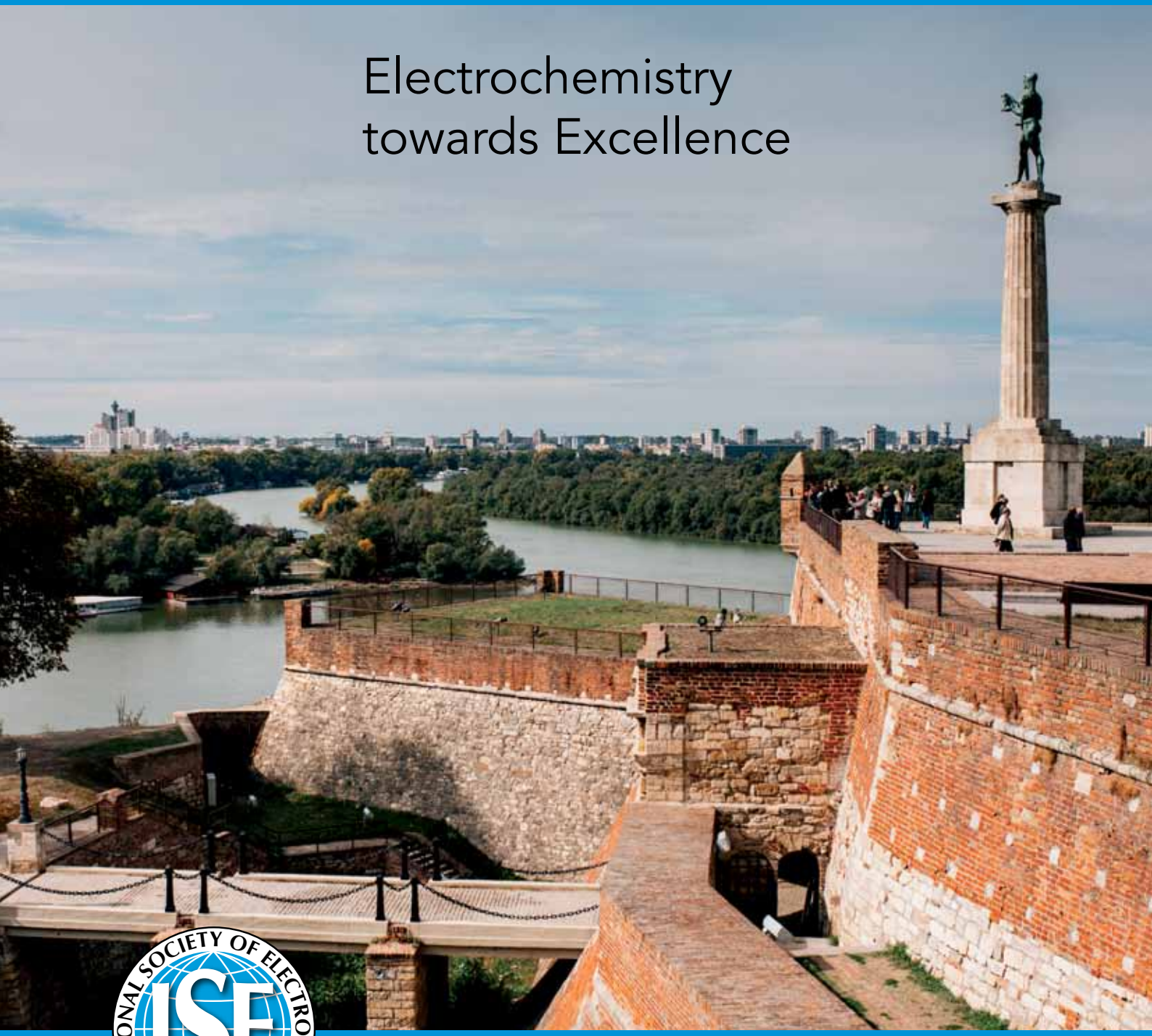
71st Annual Meeting

of the International Society of Electrochemistry

30 August - 4 September 2020
Belgrade, Serbia



Electrochemistry
towards Excellence

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71st Annual ISE Meeting - Belgrade Online - Notification of presentation acceptance

Julia Claudia Mirza Rosca <julia.mirza@ulpgc.es>

Mar 11/08/2020 22:23

Para: LUCERO BALDEVENITES <viviana.lucero@ulpgc.es>

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DE GRAN CANARIA

De: International Society of Electrochemistry <events@ise-online.org>
Enviado: lunes, 6 de julio de 2020 9:16
Para: Julia Claudia Mirza Rosca <julia.mirza@ulpgc.es>
Asunto: 71st Annual ISE Meeting - Belgrade Online - Notification of presentation acceptance

Dear Julia C. Mirza Rosca,

It is our pleasure to inform you that your submission "*Increasing the Osseoinduction of Ti6Al7Nb Tibia Implant by Surface Treatment and "in vivo" Application*" (ise202803) has been accepted and selected for **a Poster** presentation in symposium "s19" of the **ISE Belgrade Online Meeting**.

Please be aware that for your presentation to be maintained as **a Poster** presentation, we must receive your registration **before 31 July 2020**. To help us manage this first ISE Online Meeting, please register as soon as possible, don't wait until the last moment.

Link to registration: https://annual71.ise-online.org/registration.php

For all Oral presentations, you will soon receive more information from your Symposium Organizers.

Only registered participant will be able to submit a Poster (pdf), and will receive information about how to submit.

IMPORTANT DATES
Registration deadline for presentation(s): 31 July 2020
(Presentations without a registered speaker or Poster presenter will be cancelled and removed from the program on 01 August 2020).

With best wishes,

Jelana Bajat and Aleksandar Dekanski Organizing Committee co-chairs

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International Society of Electrochemistry
email: events@ise-online.org
****

Increasing the Osseoinduction of Ti6Al7Nb Tibia Implant by Surface Treatment and "in vivo" Application

Julia C. Mirza Rosca[1], Nestor R. Florido Suarez[2], Pedro P.Socorro Perdomo[1] , Tomas Gil López[3]
[1]*Mechanical Eng.Dept., University of Las Palmas de Gran Canaria,35017, SPAIN*
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Animals such as rats, guinea pigs, rabbits, dogs, sheep, goats, pigs and others with a relatively long life expectancy are suitable for long-term testing of subcutaneous tissues, bones and muscles. Pigs are one of the preferred species as they have organs and osseointegration times similar to humans and this is one of the main reasons why the minipig has been chosen as an experimental animal in our study, mainly focused on analyzing the behavior "in vivo" of a titanium alloy plate Ti6Al7Nb with nanostructured surface, from the point of view of its osseointegration and its toxicity.

A micro-nanocrystalline hydroxyapatite coating on the bioactivated surface has been deposited in two steps: immersion in NaOH solution plus heat treatment and immersion in SBF solution with additional biovitroceramic PAW1 content

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The importance of the mechanical stability of the implant is evaluated by analyzing the quality of the osseointegration at the bone-implant interface through the analysis of the amount of neoformed bone in direct contact with the implant, able to mechanically fix the implant and the type of bone tissue that is formed.

In this study, the implant was designed so that implantation is simple and as minimally invasive as possible, in the tibia (Fig.1), ensuring optimal bone-implant contact as well as load transmission (bone growth induction).

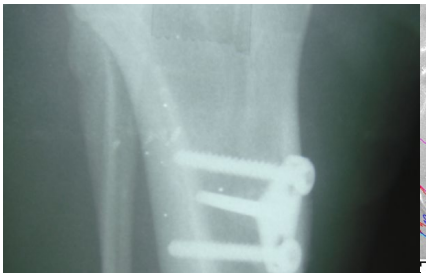

Fig.1. Radiography of the implant

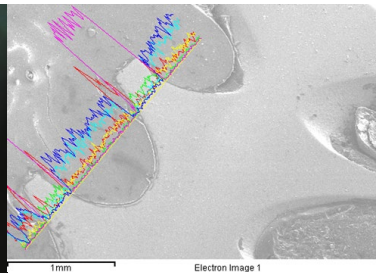

Fig.2. Metal-implant interface analysis

The implantation period has been 6 months and during the healing period the contact between the bone and the implant of each operated pig has been guaranteed, no signs of inflammation have been observed. The toxicity of the implanted metal plate was evaluated by determining the concentration of aluminium by atomic absorption in the different organs of the experimental animals.

Analysis by scanning electron microscope and EDX analyzer of the bone-implant interface of the samples indicates that there is no presence of potentially toxic elements (aluminum) belonging to the implant, results confirmed by electrochemical tests obtained in vitro before implantation.

The study of the bone-implant interface (Fig.2) of the samples from the experimental animals shows that elements belonging to the mineral part of the bone tissue (calcium, phosphorus) have been found. The average of the results obtained from the Ca/P ratio that have been analyzed for each animal allow us to confirm that there is bone growth.

Studies using the atomic absorption spectropy technique indicate that the proportion of aluminium that can affect humans due to the diffusion of this element when wearing an implant is insignificant and cannot be considered harmful compared to daily consumption through food intake or other factors.

Increasing the Osseoinduction of Ti6Al7Nb Tibia Implant by Surface Treatment and “in vivo” Application

Julia C. Mirza Rosca[1] , Pedro P. Socorro Perdomo[1],Nestor R. Florido Suarez[2],Tomás Gil López[3]

[1]*Mechanical Engineering Department, University of Las Palmas de Gran Canaria, Julia.mirza@ulpgc.es*

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Keywords:

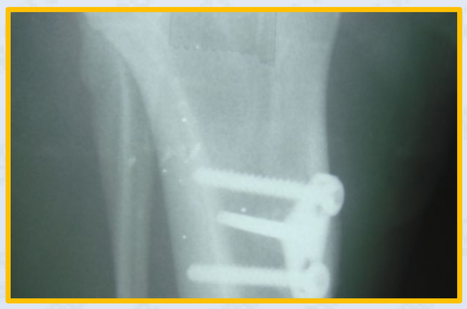
Biomaterials, corrosion, electrochemical, orthopedic

ABSTRACT

Animals such as rats, guinea pigs, rabbits, dogs, sheep, goats, pigs and others with a relatively long life expectancy are suitable for long-term testing of subcutaneous tissues, bones and muscles. Pigs are one of the preferred species as they have organs and osseointegration times similar to humans and this is one of the main reasons why the minipig has been chosen as an experimental animal in our study, mainly focused on analyzing the behavior "in vivo" of a titanium alloy plate Ti6Al7Nb with nanostructured surface, from the point of view of its osseointegration and its toxicity.

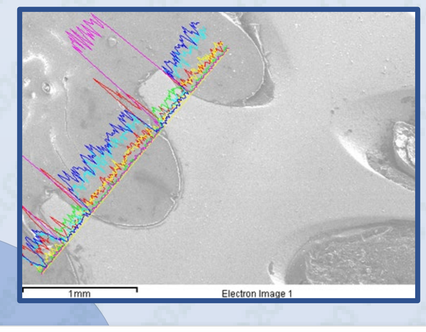
EQUIPMENT

Radiography of the implant



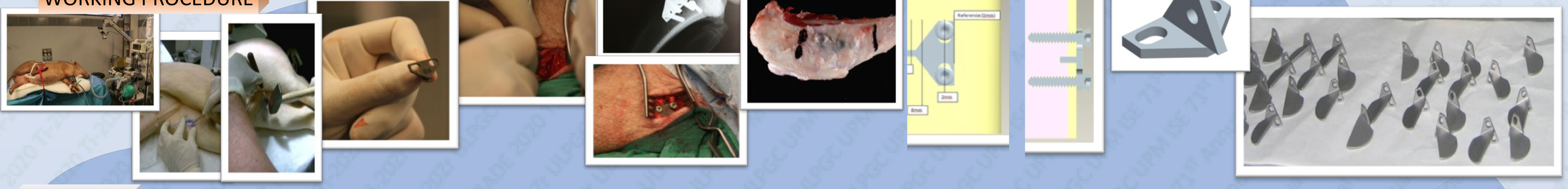
In this study, the implant was designed so that implantation is simple and as minimally invasive as possible, in the tibia, ensuring optimal bone-implant contact as well as load transmission (bone growth induction).

Metal-implant interface analysis



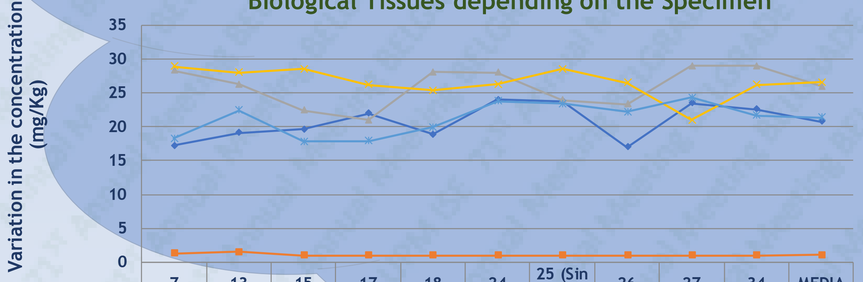
The study of the bone-implant interface of the samples from the experimental animals shows that elements belonging to the mineral part of the bone tissue (calcium, phosphorus) have been found. The average of the results obtained from the Ca/P ratio that have been analyzed for each animal allow us to confirm that there is bone growth.

WORKING PROCEDURE

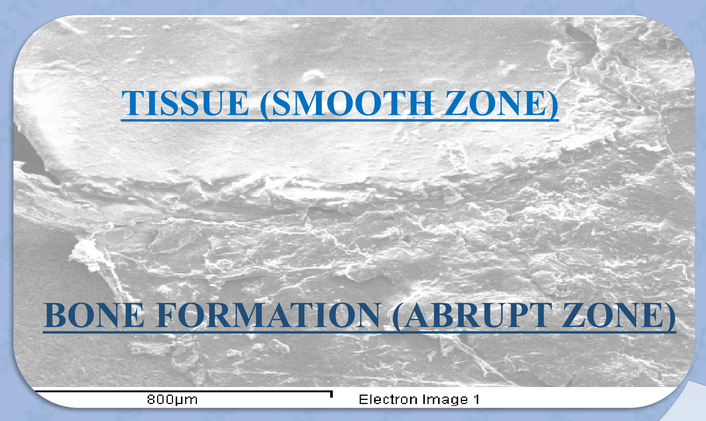


RESULTS

Variation of the Aluminum Concentration in different types of Biological Tissues depending on the Specimen

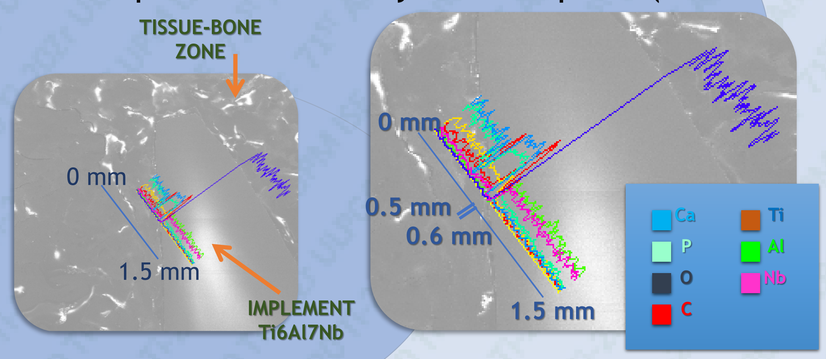


	7	13	15	17	18	24	25 (Sin Tratar)	26	27	34	MEDIA
BRAIN (mg/kg)	17,2	19,1	19,6	22	18,9	24	23,8	17	23,5	22,6	20,77
FAT (mg/kg)	1,3	1,5	1	1	1	1	1	1	1	1	1,085
KIDNEY (mg/kg)	28,3	26,3	22,4	21	28,1	28	23,9	23,3	29	29	25,93
BAZO (mg/kg)	28,9	28	28,5	26,2	25,4	26,3	28,5	26,5	21	26,2	26,55
LIVER (mg/kg)	18,3	22,4	17,8	17,9	19,9	23,8	23,4	22,2	24,3	21,7	21,37



CHEMICAL MICROANALYSIS

Bone to implant interface analysis in the tip area (1.5 mm scan)



ZONA 1: BONE FPORMATION, Ca, P, O y C (0 mm-0.5 mm)

ZONA 2: INTERPHASE, C y O (0.5 mm-0.6 mm)

ZONA 3: IMPLANTE, Ti, Al, Nb (0.6 mm- 1.4 mm)

Studies using the atomic absorption spectropy technique indicate that the proportion of aluminium that can affect humans due to the diffusion of this element when wearing an implant is insignificant and cannot be considered harmful compared to daily consumption through food intake or other factors.