



PhD in BIOINGEGNERIA / BIOENGINEERING - 39th cycle

PNRR 117 Research Field: TECHNOLOGIES INSPIRED BY NATURE FOR THE DEVELOPMENT OF MEDICAL DEVICES FOR ORTHOPAEDICS

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	<p>Bone reconstruction is often necessary in orthopedic surgery following a number of traumatic, surgically induced, chronic and degenerative conditions. Current bone substitutes available in the market have many issues including a high rate of complication, biofilm formation, rejection and need for reintervention.</p> <p>The research project is aimed at developing innovative devices inspired by nature to support orthopedic surgeons with novel implantable solutions beyond the current applications of Greenbone technology based on chemical transformation of rattan wood into hydroxyapatite and betatricalciumphosphate scaffolds.</p>
Methods and techniques that will be developed and used to carry out the research	<p>Multi-scale characterization of morphology, microstructure and material properties through ad-hoc in-vitro experiments. Development and validation of computational models to interpret the mechanical behavior of the device and to study its application to different surgical techniques and implantation sites including, for instance the spine, lower and upper limbs.</p> <p>In-vitro and in-vivo models of product efficacy and effectiveness evaluation. Elaboration of deliverables necessary for product certification according to Medical Device Regulation requirements.</p>
Educational objectives	<p>The PhD candidate will learn how to select and use different characterization techniques to assess the</p>



	<p>morphology, microstructure and material properties of bone tissues and substitutes at different scales, eventually designing original ad-hoc in-vitro experiments beyond the state-of-the-art. The PhD candidate will gain extensive know-how about the development and validation of computational models both to interpret the mechanical behavior of the device at different scales and to study its applicability in combination with surgical techniques covering the orthopedic (upper and lower limbs) and the spinal fields. The PhD candidate will learn how to select and use a variety of in-vitro and in-vivo models to test product efficacy and evaluate its effectiveness. The PhD candidate will know in details the subsequent steps and deliverables necessary for product certification according to Medical Device Regulation requirements.</p>
Job opportunities	<p>The successful PhD candidate will gain a comprehensive know-how in the design, certification and production processes of innovative devices inspired by nature to be used in the ortopedic and spinal fields. Future job opportunities as part of an innovative R&D team in the medical devices sector, technical files reviewer for Notified Bodies and/or Regulatory Agencies.</p>
Composition of the research group	<p>0 Full Professors 0 Associated Professors 5 Assistant Professors 1 PhD Students</p>
Name of the research directors	<p>PROF LUIGI LA BARBERA, DOTT ANDREA CHA</p>

Contacts	
<p>andrea.cha@greenbone.it, +393460090618, https://greenbone.it/our-people</p>	

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad



Amount monthly	1400.0 €
By number of months	7

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	GREENBONE ORTHO SPA
By number of months at the company	12
Institution or company where the candidate will spend the period abroad (name and brief description)	Institute of Material Engineering in UK,
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activity: The student will be encouraged to attend to courses at POLIMI or abroad in International Schools.

Teaching assistantship: There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer and desk availability: the student will be allowed to access facilities of the DEIB.