

EXPERTISSUES

**NOVEL THERAPEUTIC STRATEGIES FOR TISSUE
ENGINEERING OF BONE AND CARTILAGE USING SECOND
GENERATION BIOMIMETIC SCAFFOLDS**

Contract no.: 500283-2
NETWORK OF EXCELLENCE
PRIORITY 3 – NMP



FINAL PUBLISHABLE REPORT

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Campus de Gualtar – Braga, Portugal

SUMMARY

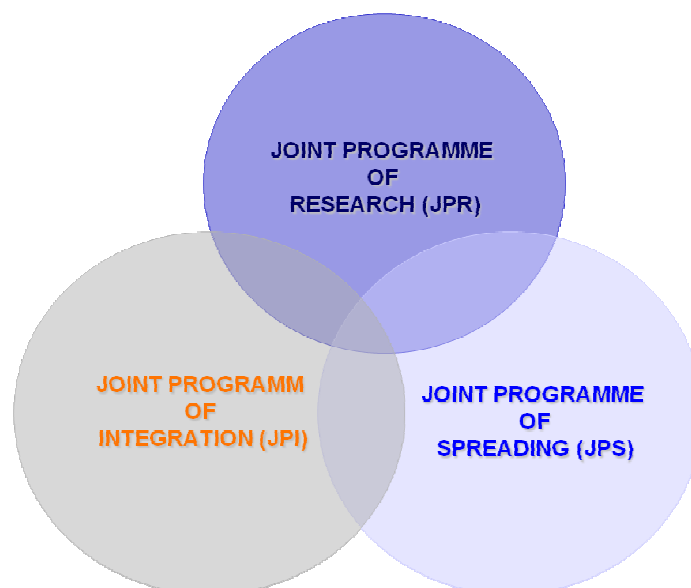
The main goal of EXPERTISSUES was to combat and overcome fragmentation of European Research on the field of Tissue Engineering of Bone and Cartilage and joint Europe's leading academic centres and several complementary industrial players in a multi-disciplinary consortium to conduct and structure research that is able to compete in the international arena, namely with USA and Japan. This was foreseen through the Creation of a Sustainable and Durable Institute, which was achieved. EXPERTISSUES European Institute of Excellence on Tissue Engineering and Regenerative Medicine EEIG is an European Economic Interest Grouping with Headquarters at Universidade do Minho, Grupo de Investigação 3B's – Biomateriais, Materiais Biodegradáveis e Biomiméticos, Avepark – Parque de Ciência e Tecnologia, Guimarães, Portugal and Branches in all Member Institutions

● Major aims and organization

The major goal of the EXPERTISSUES Network of Excellence was to integrate in an efficient and long-lasting manner, several European institutions from Academia and Industry (see table 1), with recognized expertise in tissue engineering research in order to achieve the creation of a Virtual European Centre of Excellence in Tissue Engineering, leading the way in EU for achieving a more competitive European research in this research field and contributing in the creation of the European Research Area (ERA).

The Network is formed by a number of institutions that in some cases already cooperate with each other and/or with other institutions (that may join the Network in a later stage), but which only have weak (in some cases only bi-lateral) platforms of cooperation among them. Therefore, this cooperation needs to be structured and directed towards an integrated and sustainable organization in order to produce more and better scientific outputs, allowing Europe to be more and more competitive and, ultimately to improve the quality of life of thousands of patients.

The Network activities were organized through a Joint Programme of Activities **JPA** structured in three levels: Research (JPR), Integration (JPI), Spreading (JPS) and Management.



• **Joint Programme of Research (JPR):** Major breakthroughs in tissue engineering and regeneration were foreseen by addressing the following aspects: (i) the development of adequate human cell cultures to produce the tissues (cells and matrix) in adequate polymeric scaffold materials, that can subsequently be used as a medical device, (ii) the development of culture technology with which human tissues can be grown *ex vivo* in three dimensional polymeric scaffold matrices, (iii) the development of a material technology with which degradable, three dimensional polymeric matrices can be produced, being suitable for cell culture (proliferation, differentiation) and that have mechanical properties similar to those of the natural tissue. These research activities were divided in 10 workpackages:

WP1. Raw-materials synthesis and development

WP2/3. Scaffolds design and processing and rapid-prototyping techniques for scaffolds design and processing

WP4. Surface modification and tailoring of the surface properties

WP5. Production and characterization of growth factors

WP6. Controlled release strategies for tissue engineering and regeneration

WP7. Cell isolation and culture methodologies

WP8. Bioreactors and dynamic culturing of cells

WP9. In-vivo functionality assessment

• **Joint Programme of Integration (JPI):** The Joint Program of Integration (JPI) was the instrument used to generate and install the new organisation. Integration was ultimately reached through the creation of a virtual centre of excellence. The integration of different scientific expertise in Europe is actually not so common since the scientific domains concerned do not overlap but are fragmented and spread throughout Europe in small research groups. The integration of a critical mass of resources and expertise at a European level, through the creation of a new organisation with different integrated networking activities, aimed primarily at creating a durable integration of the research capacities of the network, in order to provide European leadership and to be a world force in this topic. The integration activities were divided in four main workpackages:

WP11. Characterization of materials, scaffolds, surfaces, cells, products, and others

WP12. Quality assurance and regulatory affairs

WP13/14. Structuring and integrating the NoE activities towards the creation of a sustainable and durable Virtual Institute of Excellence

• **Joint Programme of Spreading (JPS):** The spreading of excellence was a major goal of this network, since it aims to create a virtual research centre at the European level, going beyond the almost inexistent borders between EU countries and integrating associated countries. The network has also a transatlantic component with its USA and Canadian partners and a link to Asia. The excellence created within this network with the joining in a common and long lasting cooperation of the best European groups in this area of research enabled the generation of knowledge that was disseminated either by the training of multidisciplinary researchers, as well as by actions towards the scientific community and to the general public.

EXPERTISSUES carried out several activities to spread excellence within the network and also beyond the network members, with a particular emphasis on the training activities. These activities were divided in four main workpackages:

WP15/17. Spreading of results and of excellence and actions to the general public

WP16. Training of post-graduate students

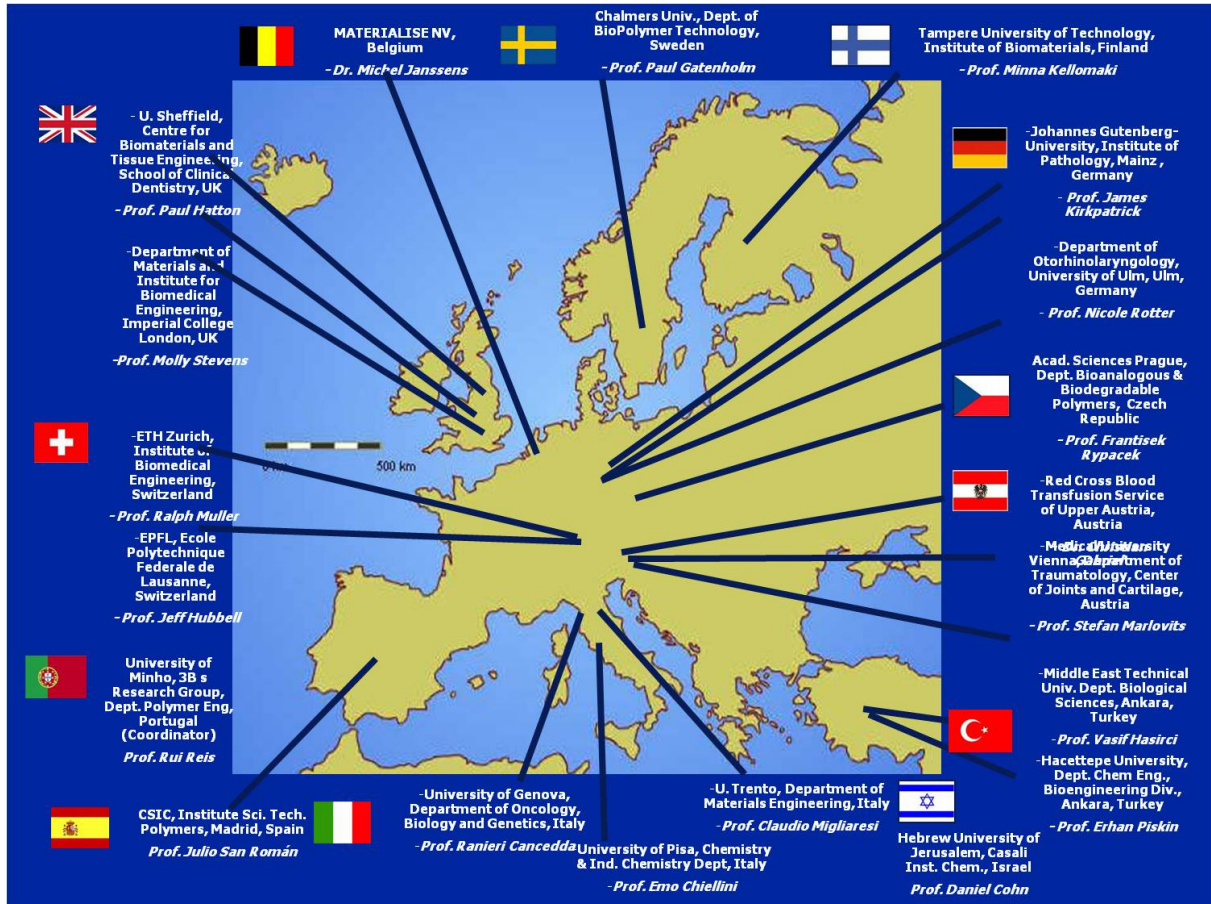
WP18. Continuous search for partners of excellence

•**Management:** Three different levels of activities were distinguished for the management of such a large network with so many partner profiles and interests, including i) the decision making processes, the operational management and the implementation and assessment. The management and organization activities of the NoE are carried out under workpackage 19:

WP19. Management and organization of the network of excellence

Furthermore, EXPERTISSUES comprised a number of management and organizational structures that worked in specific areas that were critical for the development on an integrated Network. These structures include the Steering and Management Committee (SMC), the Research and Technical Committee (RTC), the Integration Committee (IC), the Education and Training Committee (ETC), the Quality Assurance Board (QAB), The Gender Awareness Group (GAG) the Exploitation and Commercialisation Committee (ECC), the International Advisory Board (IAB – see table 2) and the Internal Ethical Advisory Committee (IEAC).

PARTNERSHIP



EXPERTISSUES partners:

Participant name	Country
University of Minho, 3B's Research Group, Dept. Polymer Eng.	Portugal
CSIC, Institute Sci. Tech. Polymers, Madrid	Spain
University of Pisa, Chemistry & Ind. Chemistry Dept.	Italy
University of Tampare, Institute of Biomaterials	Finland
Ludwig Boltzman Institute, LBI Trauma Care, Vienna	Austria
Acad. Sciences Prague, Dept. Bioanalogous & Biodegradable Polymers	Czech Republic
Johannes Gutenberg-University, Institute of Pathology, Mainz	Germany
ETH Zurich, Institute of Biomedical Engineering	Switzerland
EPFL, École Polytechnique Fédérale de Lausanne	Switzerland
Middle East Technical Univ. Dept. Biological Sciences, Ankara	Turkey
Hacettepe University, Dept. Chem Eng., Bioengineering Div., Ankara	Turkey
U. Trento, Department of Materials Engineering	Italy

U. Sheffield, Centre for Biomaterials and Tissue Engineering, School of Clinical Dentistry	UK
Hebrew University of Jerusalem, Casali Inst. Chem.	Israel
Chalmers Univ., Dept. of BioPolymer Technology	Sweden
Univ. Keele	UK
Ulm University, Department of Otorhinolaryngology	Germany
MATERIALISE NV	Belgium
Cell Med	Germany

Additional - 2nd Tier partners:

Participant name	Country
Medical University Vienna, Department of Traumatology, Center of Joints and Cartilage	Austria
Cross Blood Transfusion Service of Upper Austria	Austria
University of Genova, Department of Oncology, Biology and Genetics	Italy
Imperial College London, Department of Materials and Institute for Biomedical Engineering	UK

During the course of the project, it was defined a process for the inclusion 2nd tier partners, that included an application form and its evaluation by the pre-selected committee, according with the approved evaluation procedure.

The participation of 2nd tier members in the NoE activities has been made by the co-supervision of EXPERTISSUES integrated PhD students, preparation of project's proposals under FP7, participation in the EXPERTISSUES meetings.

International Advisory Board:

Participant name	Country
Rice University, Department of Bioengineering, Houston	USA
Centre for Clinical Bioengineering University of Texas, San Antonio	USA
U. Pennsylvania, Centre for Bioactive Materials and Tissue Engineering, Philadelphia	USA
U. Toronto, Institute for Biomaterials and Biomedical Engineering	Canada
Queensland University of Technology	Australia
Tufts University, Department of Biomedical Engineering, Boston	USA
Harvard School of Engineering and Applied Sciences, Cambridge	USA
Tokyo Women's Medical University, Institute of Advanced Biomedical Engineering and Science	Japan
Kyoto University, Dept. Biomaterials, Institute for Frontier Medical Sciences	Japan
European Commission representative (scientific officer appointed to the project)	Belgium

MAJOR ACHIEVEMENTS

● **Creation of the EXPERTISSUES European Institute of Excellence for Tissue Engineering and Regenerative Medicine EEIG**

In what concerns the formal creation of the Institute, the procedure for registration of the Institute in the Portuguese registration office has been completed. All partners of the NoE are either Full Members, Associated members or Cooperating members.



Headquarter of the EXPERTISSUES European Institute of Excellence for Tissue Engineering and Regenerative Medicine EEIG

A major achievement was the inauguration of the headquarters of the European Institute of Excellence for Tissue Engineering and Regenerative Medicine (EXPERTISSUES EEIG) in June 2008. A guided visit was organized for the TERMIS-EU participants that wished to make contact with the facilities and with the EXPERTISSUES partners.

The headquarters of the EXPERTISSUES EEIG, also home of 3B's Research Group, was awarded with two major prizes, *Novo Norte2010* Innovation Award together with the Best Practices in Northern Portugal Award for the Year 2010 which largely contribute to divulge the EXPERTISSUES Virtual Institute in Portugal.

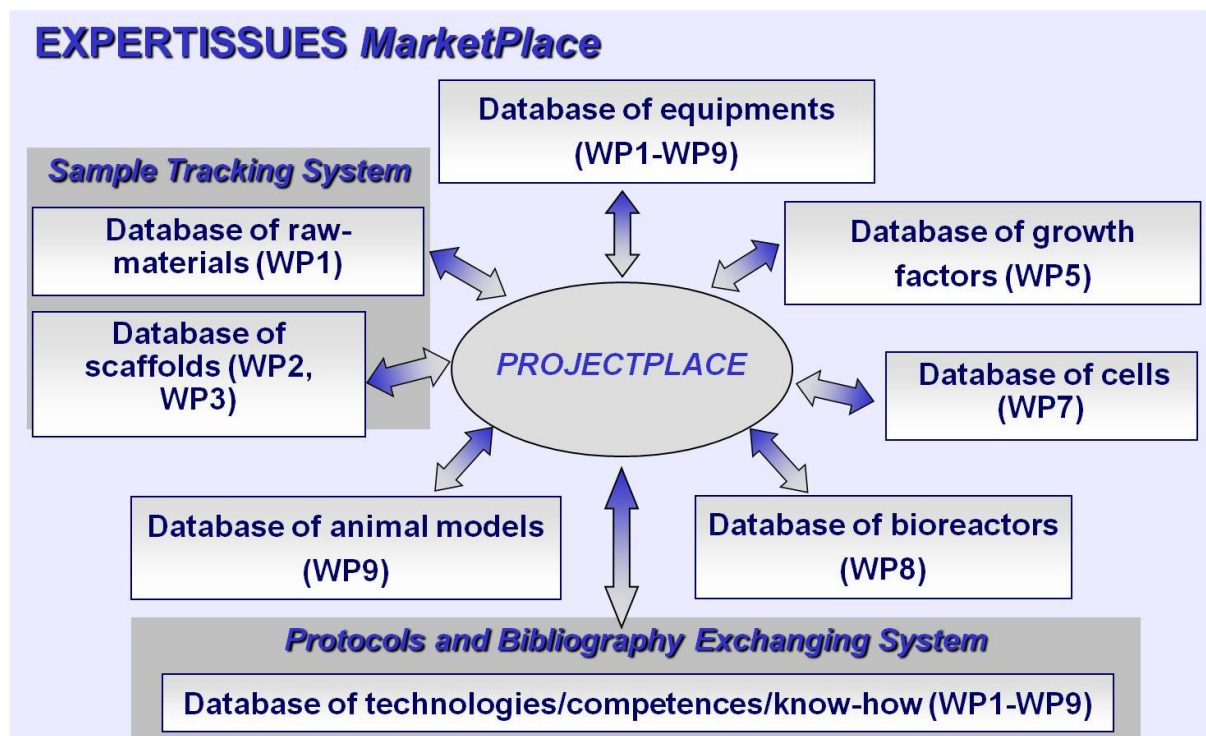
● **Design and implementation of a common and single identity/brand/logo of the network - High Quality logo/Stamp**

All Institutions participant in the NoE are identified with Logo in their home institution web page, as well as a link to www.expertissues.org, researchers identified with the logo, all partners laboratories are identified as being an EXPERTISSUES Lab and all joint publications and communications have been identified with the logo and acknowledgement to EXPERTISSUES. Also a list of events have

been organized and endorsed by the network as can be seen above. EXPERTISSUES has also participated in TERMIS-EU with an exhibition booth. This has as a major result a large advertisement of the network which results that EXPERTISSUES logo became a well recognized quality stamp.

● **Common platforms for the characterization of the developed materials/ hybrid constructs**

One of the main tools of integration was the EXPERTISSUES MarketPlace – a set of databases of infrastructures, materials, cells, techniques, competences, know-how... – available within the network and to which all partners can have access to and it is through it that partners share and use common infrastructures and know-how. At the present moment the partners can access the raw materials, scaffolds, equipments and surface modification, production of growth factors, bioreactors, cells and animal models databases. During this year, all databases have been updated and will be available in the new EXPERTISSUES EEIG website.



● **European MSc/PhD Programme on tissue engineering/ Mobility of students/researchers**

A Standard Operational Procedure has been created for the EXPERTISSUES Mobility Programme and mobility of students, researchers and staff through different labs to acquire interdisciplinary knowledge and training is being extensively carried out since the beginning of the project. Almost every partner is sending and receiving researchers/staff according to their own expertise which allows the development of research work and transference of

knowledge within the NoE that would be impossible to achieve by isolated partners. Additionally, several visits to partner universities by PI and students have been performed for comprehensive discussions on the various projects they are collaborating on. It was created the EXPERTISSUES Integrated PhD Programme, with well defined formal rules and quality indicators, as well as the decision mechanism to attribute certificates to the potential candidates. The EXPERTISSUES Integrated PhD Certificate was attributed to more than 35 students.

● **Electronic platform for exchange of expertise/knowledge/information on tissue engineering**

A public access web site (HUwww.expertissues.orgUH) was created and constantly updated with information on the network structure, research, training and education, news, calendar of events, photo gallery, EXPERTISSUES E-books and Newsletters, relevant links, projects related with the network, calls open in the partners, the new Journal of Tissue Engineering and Regenerative Medicine (TERM). Selected information on the EXPERTISSUES European Institute of Excellence for Tissue Engineering and Regenerative Medicine EEIG and its headquarters has also been updated in the public web site.

The corporate image of the European Institute of Excellence for Tissue Engineering and Regenerative Medicine has as base the image of the EXPERTISSUES NoE that is already a recognized brand in the field but a new EXPERTISSUES EEIG website was created <http://www.expertissues.eu/>.

The EEIG website will be the main platform to create and sustain a working environment favorable to do and support collaborative research, for sharing resources, standardizing processes and procedures, and offering services. Through the EXPERTISSUES EEIG website, the EEIG members and scientific community outside the EEIG, will be able to find information on services, consultation, resources, equipments and expertise provided by the EEIG. This will constitute an important commercial basis for the EXPERTISSUES EEIG to support the implementation of ambitious multidisciplinary research and development programs in the field of Tissue Engineering and Regenerative Medicine.

Based on this, the website contains general information accessible to public but also a restricted area that will permit a straight and confidential interaction and exchange of information between the partners. In what concerns the public access, the home page of the EXPERTISSUES EEIG allows the outside community to learn about the vision, the mission and the strategy that the partnership will follow to attain the defined objectives. Furthermore, and since the EXPERTISSUES EEIG is open to enlarge its expertise and according to the successive strategic decisions made, it will be possible, through the website to know how and to apply to become a member of the EXPERTISSUES EEIG.

EXPERTISSUES EEIG website also compiles all relevant information such as equipments and infrastructure available, as well as competences and know-how consolidated that can be made available to external stakeholders under specific conditions.

Following EXPERTISSUES NoE policy, the EXPERTISSUES EEIG will be also deeply involved in the management, endorsing and organizing of scientific events as well as in the promotion and organization of educational and training programs aiming to support career development of young researchers. These will be focusing the development of interpersonal, scientific, regulatory and managerial competences at EXPERTISSUES EEIG members' location(s). EXPERTISSUES EEIG website will have a major role on divulging these initiatives not only to the scientific community but in many cases to general public providing access to high quality information.

● **Standardization-Proposal of standards for lacking regulation on tissue engineering related research**

On the scope of the Portuguese Presidency of the European Council, an open workshop was organised on 18-19 October 2007 to discuss with all concerned stakeholders the scientific aspects and requirements for the authorisation of cell-based medicinal products. The discussion in the workshop focused on the draft guideline created by CPWP and BWP and on the comments received during the external consultation.

The workshop took place in Lisbon on the 18th and 19th of October 2007 and is organised jointly with INFARMED (the regulating authority in Portugal in what regards medicinal products) and the EXPERTISSUES NoE. EXPERTISSUES was specifically responsible for the organisation of a satellite meeting adjacent to this workshop that took place on the 19th of October in the afternoon. This meeting has focused on scientific aspects in relation to development and marketing authorisation applications for cell therapy medicinal products and tissue engineered products. EUROPEAN GUIDANCE: <http://www.emea.europa.eu/pdfs/human/cpwp/41086906en.pdf>. It was particularly directed to Regulatory affairs department of companies developing cell-based products, for cell-biologist working in academia and start-up companies and for European Regulatory Authorities evaluating clinical trials and marketing authorisation applications.

The participation of several EXPERTISSUES partners in this event was very significant. This meeting was very important in the sense that it has contributed to some adjustments to the guideline, which was discussed from different points of view.

Austrian and Finish Presidencies were contacted regarding regulatory activities. There was a participation of individual partners in different meetings and EC stakeholders meetings.

In what concerns the new legislation on advanced therapy medicinal products, the Working Party on Cell-based products (CPWP) and the Biologists Working Party (BWP) of the European Medicines Agency (EMA) have developed a guideline on quality, non-clinical and clinical development of cell-based medicinal products (cell therapy medicinal products and tissue engineering products). This guideline was published for external consultation.

● **Implementation of Quality Assurance systems in all institutions of the NoE**

The “EXPERTISSUES QA CERTIFICATE” was created to be awarded to all the EXPERTISSUES partners that demonstrate the implementation of a QA System following the minimal requisites that were initially established, based on GMP/GLP and ISO 9001 guidelines. Partners applied to obtain this certificate and audits to these partners were performed. This certificate is considered a minimal requirement for access the core facilities of the EXPERTISSUES EEIG.

● **Combat fragmentation of TE research in Europe - Joint Research Projects**

Several joint research projects to combat fragmentation of TE research in Europe were carried out by EXPERTISSUES partners, several projects were approved in FP6:

1. Marie Curie Host Fellowships for Early Stage Research Training *Alea Jacta EST - Shaping the Future of a New Generation of Hybrid Human Resources for the Tissue Engineering of Connective Tissues*
2. Marie Curie Series of Events *InVents - An Integrated Series of Events for High-level Training on Biomaterials, Tissue Engineering, Controlled Drug Delivery and Related Emerging Fields*

Several other proposals were submitted but were not approved for funding by the EC. Regarding FP7 **Joint Proposals**, several proposals have been submitted.

● Edition of a new Journal on Tissue Engineering

One of the most relevant outcomes of the EXPERTISSUES NoE was the creation of a new Journal in the field of Tissue Engineering and Regenerative Medicine. After consultation of the three main Publishers (Elsevier, Springer and VCH-Wiley), an agreement was reached with John Wiley and Sons Ltd.



The new journal, Journal of Tissue Engineering and Regenerative Medicine (TERM), was presented by Rui L. Reis, the editor in chief in a plenary session of the Tissue Engineering & Regenerative Medicine International Society (TERMIS) European Meeting held in October 2006 in Rotterdam. The Editors (Rui L. Reis, Samuel I. Stupp, Hajime Ohgushi and Anthony Atala) and the Editorial Board, constituted by 70 scientists of the highest standard in all fields related with tissue engineering, regenerative medicine, biomaterials, stem cells and related areas, making this one of the strongest Editorial Boards in this field of research. All EXPERTISSUES Research Team Leaders are members of the Editorial Board of the journal and all the integrated PhD students are obliged, according to the criteria established to obtain an EXPERTISSUES Integrated PhD, to submit at least one paper to JTERM.

This Journal is one of the major achievements of the NoE with impact in all the fields of research and constitutes a powerful tool for divulgation of results and spreading of excellence in a high impact and durable manner.

The journal, with a total of 26 issues published from the 2007 to now is already cited in Web of Science (Science

Citation Index Expanded), Biotechnology Citation Index, BIOSIS Previews, Biological Abstracts. JTERM was included in the 2008 Impact factor scores (1.615) and in 2009 increased to 3.857.

● New and competitive tissue engineering knowledge and potential therapies

A Strategic Business Plan for the EXPERTISSUES European Institute for Tissue Engineering and Regenerative Medicine EEIG was elaborated to address the exploitation and commercialization of TE products and therapies developed.

DISSEMINATION AND SPREADING

Selected Publications

The spreading of EXPERTISSUES results and knowledge to the exterior has continued to be mainly achieved through the publication of several joint papers, in the new Journal of Tissue Engineering and Regenerative Medicine (TERM) that resulted from the NoE and other international journals and through the presentation on several international conferences of posters and oral communications of scientific achievements resulted from the network with the proper acknowledgment to EXPERTISSUES.

Book Chapters

- V.Hasirci, D.Yucel, 'Polymers Used in Tissue Engineering, in 'Encyclopedia of Biomaterials and Biomedical Engineering, 1 - 17, 2007.
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- Pereira RC, Gentili C, Cancedda R, Azevedo HS and Reis RL, 2010, Naturally-Derived Gel Forming Materials for Cell Encapsulation: Applications and Challenges in Cartilage Regeneration, In 3D Cell culture - a review of current techniques, eds. Haycock JW, in press
- Martins AM, Alves CM, Reis RL, Mikos AG and Kasper FK, 2009, Toward Osteogenic Differentiation of Marrow Stromal Cells and In Vitro Production of Mineralized Extracellular Matrix onto Natural Scaffolds, In Biological Interactions on Materials Surfaces: Understanding and Controlling Protein, Cell, and Tiss, eds. Puleo DA, Bizios R, Springer, New York, 263-281

Joint papers (2009 and 2010 only)

- Aydin HM, El Haj AJ, Piskin E, Yang Y. Improving pore interconnectivity in polymeric scaffolds for tissue engineering. *J Tissue Eng Regen Med* 2009;3(6):470-476.
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- Hardmeier R, Redl H, Marlovits S. Effects of mechanical loading on collagen propeptides processing in cartilage repair. *J Tissue Eng Regen Med*:4(1):1-11.
- Peterbauer-Scherb A, van Griensven M, Meinel A, Gabriel C, Redl H, Wolbank S. Isolation of pig bone marrow mesenchymal stem cells suitable for one-step procedures in chondrogenic regeneration. *J Tissue Eng Regen Med*.
- Wolbank S, Hildner F, Redl H, van Griensven M, Gabriel C, Hennerbichler S. Impact of human amniotic membrane preparation on release of angiogenic factors. *J Tissue Eng Regen Med* 2009;3(8):651-654.
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Organization and/or Endorsement of Scientific Events by EXPERTISSUES

All the partners have been participating in the most relevant conferences in the field and in many cases presenting works that resulted from the cooperation and integration activities carried out within the NoE. The majority of the works presented in these conferences was published in the conference proceedings. Several EXPERTISSUES workshops, courses have been organized and/or sponsored/endorsed during the all project and other are planned to be held after the end of the NoE. Furthermore, open doors sessions were organized by several EXPERTISSUES. Some of these events are listed below:

- 6th International Symposium on Frontiers in Biomedical Polymers, Granada, Spain, 16-19 June 2005.
- 1st ALEA JACTA EST & 1st EXPERTISSUES Tutorial Course "Biomaterials and Tissue Engineering", Ischia, Italy, 16-17 July 2005.
- 3rd Baltic Stem Cell Conference "Tissue Engineering in Head and Neck Surgery & Clinical Cell Therapy for Myocardial Regeneration", Rostock-Heiligendamm, Germany, 22-24 August 2005.
- 2nd ALEA JACTA EST & 2nd EXPERTISSUES Tutorial Course "Tissue Engineering of Bone and Cartilage: Current Trends and Future Perspectives", Antalya, Turkey, 18-19 October 2005.
- EXPERTISSUES Workshop "Cellular Aspects of Tissue Engineering", Vienna, Austria, 23 March 2006.
- Workshop "Bioreactor Design and Stem Cell Processing", The Dome, Buxton, England, 18-22 June 2006.
- EXPERTISSUES Training Course "Cell-Biomaterial Interfaces: From Theory to Practice", Prague, Czech Republic, 17-20 October, 2006
- EXPERTISSUES Workshop "Cell-Biomaterials Interactions", Prague, Czech Republic, 21 October 2006.

- 3rd ALEA JACTA EST/EXPERTISSUES Tutorial Course on “Drug Delivery”, Cala Galdana, Menorca, 25-27 May 2006.
- EXPERTISSUES Course Bulk “Surface and Biological Characterization of Materials: Fundamentals of Theory and Practice”, Trento, Italy, 10-12 April 2007.
- Cluster for Tissue Regeneration, Vienna, Austria, 19 April 2007.
- 1st Summer School of TERMIS-EU, European Chapter of the Tissue Engineering and Regenerative Medicine International Society: Key Elements of Tissue Engineering, 1-3 June 2007, Madeira, Portugal.
- 3rd Marie Curie Cutting Edge Conference on Biomineralisation of Polymeric Materials, Bioactive Biomaterials and Biomimetic Methodologies, 4-8 June 2007 Madeira, Portugal.
- Training course “Bioreactor Design for Skeletal Tissue Engineering”, Keele, UK, 20-21 June 2007.
- 4th European Symposium on Biopolymers (ESBP 2007) “Molecular Basis, Production & Applications of Biopolymers, In Biotechnology, Biomedicine & Nanobiomaterials”, Kuşadası, Turkey, 2-4 October 2007.
- 4th Marie Curie Cutting Edge Conference “Biocompatibility Evaluation and Biological Behaviour of Polymeric Biomaterials”, Algarve, Portugal, 9-13 October 2007.
- EMEA/INFARMED/EXPERTISSUES Workshop “European Guideline on Cell-based Medicinal Products, Lisbon, Portugal, 18-19 October 2007.
- 1st EXPERTISSUES School “Communication in Tissue Engineering I”, January 2008, Trento, Italy.
- 3rd Bioreactors Course “Bioreactor Design for Skeletal Tissue Engineering, Keele, United Kingdom, 17-20 November 2008.
- EXPERTISSUES Winter School “Scientific Writing and Communication in Tissue Engineering”, Sport Hotel Panorama, Fai della Paganella (Trento), Italy, 17-21 February 2008.
- Seminar “Innovative Cartilage and Bone Repair - Advances in Tissue Engineering and Regenerative Medicine”, Gothenburg, Sweden, 27 March 2008.
- 5th Marie Curie Cutting Edge Conference, Synthesis and Applications of Self-assembling Materials at Nano-scale, Madeira, Portugal, 14-18 April 2008.
- 5th Tampere Symposium “Tissue Engineering”, Tampere, Finland, 23-25 April 2008.
- Workshop “Networking/Platforming in Biomedical Technologies: Focusing on NanoBiotechnology”, Marmaris-Mugla, Turkey, 3-8 May 2008.
- BIOMED 2008 - 14th *International Biomedical Science and Technology Symposium and 60th birthday of Prof. Piskin* (HU), Sarigerme-Mugla at Magic Life Sarigerme Imperial Hotel, Turkey, 5-7 May 2008.
- 4th National Affinity Symposium, Marmaris-Mugla, Turkey, 8-9 May 2008.
- 3rd BBSRC & EXPERTISSUES Bioreactor Course, Keele, UK, June 2008.
- Symposia in TERMIS-EU Conference “NoE EXPERTISSUES Symposium: Advances on Multidisciplinary Research for the Tissue Engineering of Bone and Cartilage I & II” and “Educational Aspects of Tissue Engineering: a Symposium by the NOE EXPERTISSUES”, Porto, Portugal, 22-26 June 2008.
- 15th CIRMIB-EXPERTISSUES Biomaterials School: Nanomedicine: Imaging, Drug Release, and Regenerative Medicine Ischia, Italy, 7-11 July 2008.
- 6th Marie Curie Cutting Edge Conference “Stem Cells from the Petri Dish to the Clinical Application, Algarve, Portugal, 27-31 October 2008.
- 1st EXPERTISSUES Workshop “Collagen Biochemistry”, Lubeck, Germany, 14-16 October 2008.
- EXPERTISSUES Winter School “Animal Models and Imaging”. Radstadt, Austria, 26 - 30 January 2009.
- 1st Marie Curie Cutting Edge Practical Training Course “Polymer Chemistry and Controlled Drug Delivery”, CSIC, Madrid, Spain, 18-28 June 2009

- 2nd Marie Curie Cutting Edge Practical Training Course on Tissue Engineering, Stem Cells and Biocompatibility Testing of Biomaterials - IZKF BIOMAT, University Hospital, Aachen, Germany, 24 August – 3 September 2009.
- 3rd Marie Curie Cutting Edge Practical Training Course “Fabrication and Characterisation of Tissue Engineering Scaffolds”, European Institute of Excellence in Tissue Engineering and Regenerative Medicine, Avepark, Guimarães, Portugal, 7-18 September 2009.
- 2nd EXPERTISSUES Spring or Summer School “Communication in Tissue Engineering II”, Portugal 1st EXPERTISSUES Workshop “Biological and Biomimetic Materials for Regenerative Medicine”, Oxford UK, 1-2 April 2009.
- EXPERTISSUES Final Scientific Meeting, European Institute of Excellence in Tissue Engineering and Regenerative Medicine, 26-27 July 2010, AvePark, Guimarães, Portugal.
- Training Course “Bioreactors and Growth Environments for Tissue Engineering”, Keele Management Centre, Keele University & UNHNS Medical Institute, UK, 15-18 November 2010.
- EXPERTISSUES Winterschool 2011 "Preclinical Models and Imaging in Musculoskeletal TE", Radstadt, Salzburg, Austria, 16-19 January 2011.