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3D-Printed Implants

Reconstruction of large bone defects after bone tumour resection

Additive Manufacturing of PEEK Scaffolds

Biomechanical consideration in AM translation

Decellularized ECM Bio-Inks

Unique properties for cartilage tissue engineering

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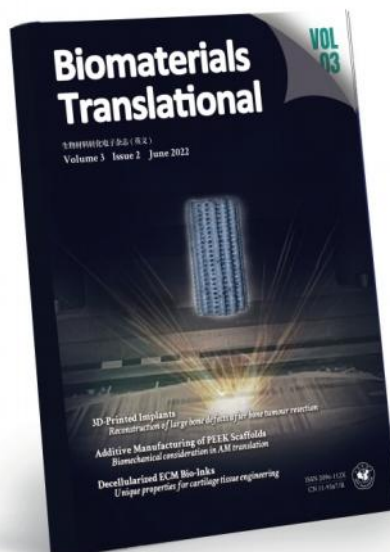
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Biomaterials Translational is an electronic journal, which will be printed on demand of readers.



Advances in 3D printing have opened new possibilities to fabricate biomedical devices or constructs with synergistic biological and mechanical properties that can mimic the natural tissue structures and physiological environment, as highlighted by Seyed Ataollah Naghavi et al. in their Research Article on page 142.

Cover image: by Florence R. Wang

Biomaterials Translational is an international journal publishing research at the interface of translational medicine, biomaterials science and engineering. The journal publishes original, high-quality, peer-reviewed papers including original research articles, reviews, viewpoints and comments. Translational medicine is an interdisciplinary field that applies emerging new technologies and sciences to the prevention, diagnosis and treatment of human disease, with a particular focus on animal disease models in the application of biomaterials for treatments. Thus, the journal highlights breakthrough discoveries in basic science and clinical application of biomaterials, as well as other significant findings related to the translation of biomaterials.

The scope of the journal covers a wide range of physical, biological and chemical sciences that underpin the design of biomaterials and the clinical disciplines in which they are used.

Original articles will be considered for publication within, but not limited to, the following domains:

- Investigation of human biology and pathogenesis of diseases with potential applications of biomaterials in treatment
- Synthesis, characterization and biomedical potential of metallic, ceramic, polymeric, composite and hybrid biomaterials
- Physical, chemical, biological, pharmaceutical and toxicological features of biomaterials
- Drug and gene delivery system design, with a focus on its application to disease conditions
- Short-term and long-term biocompatibility of biomaterials
- *In vivo* disease models and the biology of the host response in application of novel biomaterials
- Biomaterials design for modern diagnosis and therapeutic clinical practice (bioimaging, biosensing, biotherapy)
- Stem cell–biomaterial-based tissue engineering

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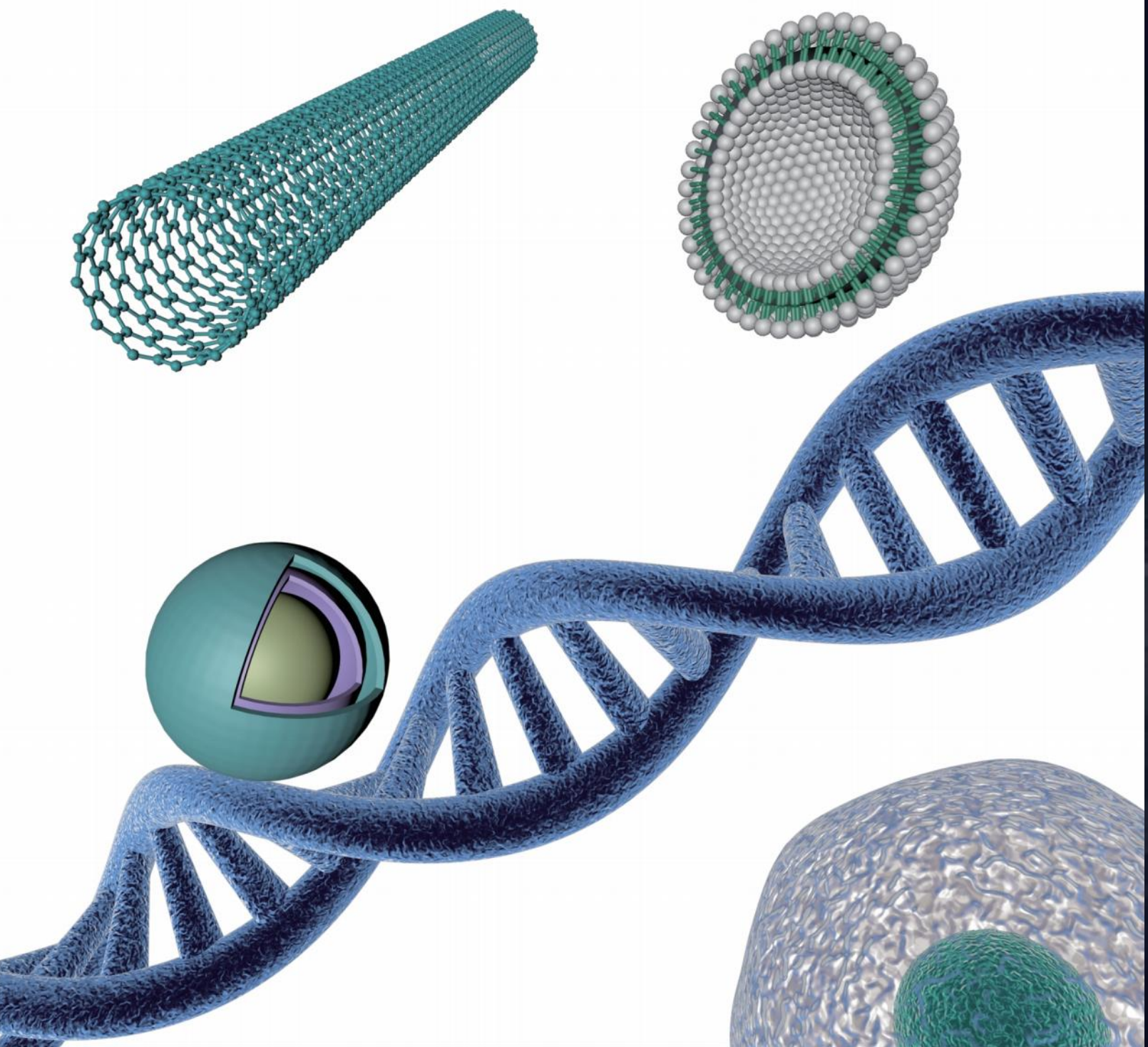
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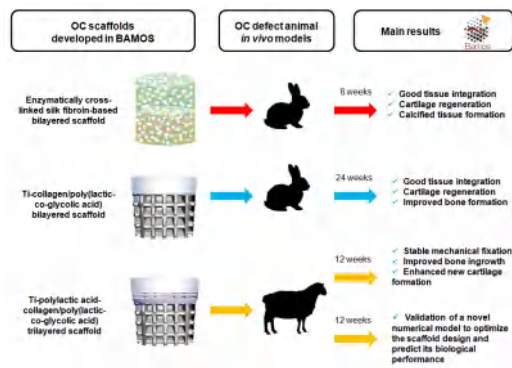
EDITORIAL

- 99 **Additive manufacturing innovation for musculoskeletal tissue repair and regeneration: from bench to bedside**
Chaozong Liu, Zhidao Xia

VIEWPOINT

- 102 **Translation through collaboration: practice applied in BAMOS project in *in vivo* testing of innovative osteochondral scaffolds**

Ricardo Donate, Maryam Tamaddon, Viviana Ribeiro, Mario Monzón, J. Miguel Oliveira, Chaozong Liu

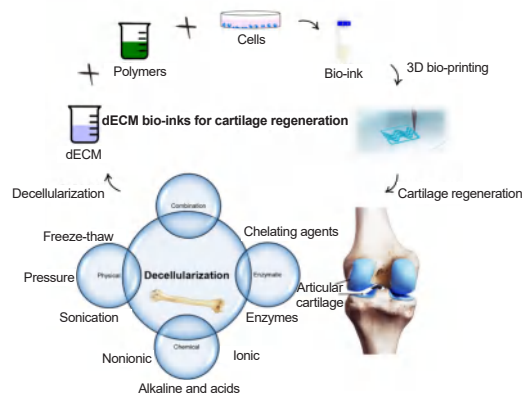


The main results of the *in vivo* evaluations carried out in Biomaterials and Additive Manufacturing: Osteochondral Scaffold (BAMOS) project, funded under Horizon 2020 Research and Innovation Staff Exchanges (RISE) program, are summarized. Animal models of osteochondral defect have been used to assess the biological performance of the different multi-material and multi-layered scaffolds developed.

REVIEWS

- 105 **Three-dimensional bio-printing of decellularized extracellular matrix-based bio-inks for cartilage regeneration: a systematic review**

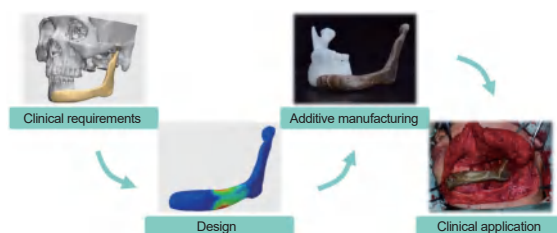
Melika Sahranavard, Soulmaz Sarkari, SeyedeMina Safavi, Farnaz Ghorbani



Decellularized extracellular matrix (dECM) can be used as a potential bio-ink for cartilage tissue engineering. This bioink can provide natural cues for cell adhesion and tissue regeneration. Here, the properties, sources, preparation process of dECM bio-inks, and previous studies on dECM bio-ink bio-printing for cartilage regeneration were reviewed.

- 116 **Additive manufactured polyether-ether-ketone implants for orthopaedic applications: a narrative review**

Changning Sun, Jianfeng Kang, Chuncheng Yang, Jibao Zheng, Yanwen Su, Enchun Dong, Yingjie Liu, Siqi Yao, Changquan Shi, Huanhao Pang, Jiankang He, Ling Wang, Chaozong Liu, Jianhua Peng, Liang Liu, Yong Jiang, Dichen Li

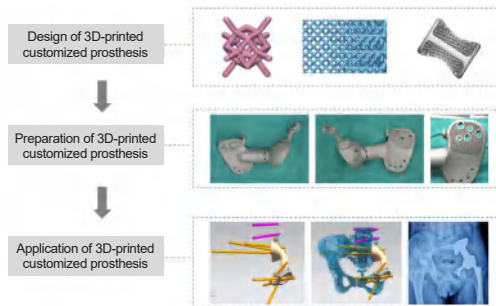


Polyether-ether-ketone (PEEK) is a candidate material for the manufacture of next-generation orthopaedic implants. Customised PEEK implants have been used in clinical applications with the development of additive manufacturing. The design, manufacturing, evaluation and typical applications of PEEK customised implants are comprehensively reviewed.

RESEARCH ARTICLES

134 Three-dimensional-printed titanium prostheses with bone trabeculae enable mechanical-biological reconstruction after resection of bone tumours

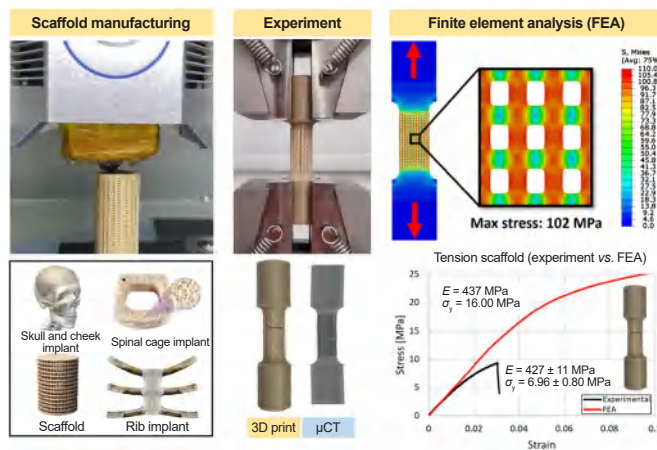
Feifei Pu, Wei Wu, Doudou Jing, Yihan Yu, Yizhong Peng, Jianxiang Liu, Qiang Wu, Baichuan Wang, Zhicai Zhang, Zengwu Shao



Three-dimensional (3D)-printed prostheses with an individualised design can achieve satisfactory short-term clinical efficacy in the reconstruction of large bone defects after bone tumour resection. Using this method it is possible to print complex structures that are difficult to fabricate using traditional processes, and overcome the problems of stress shielding and low biological activity of conventional prostheses.

142 On the mechanical aspect of additive manufactured polyether-ether-ketone scaffold for repair of large bone defects

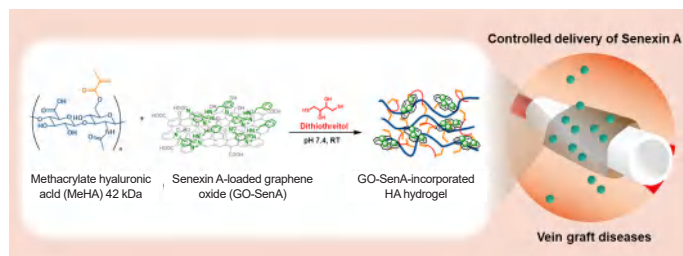
Seyed Ataollah Naghavi, Changning Sun, Mahbubeh Hejazi, Maryam Tamaddon, Jibao Zheng, Leilei Wang, Chenrui Zhang, Swastina Nath Varma, Dichen Li, Mehran Moazen, Ling Wang, Chaozong Liu



Polyether-ether-ketone is an excellent biomaterial that has potential in orthopaedic applications. Additive Manufacturing has been widely used in fabrication of customer-tailored implants such as skull, spinal cage, rib cage, and scaffold for large bone defect reconstructions. The achieved mechanical performance of the implants is a key factor for translation of additive manufacturing. In this study, the compression, tension, three-point bending and torsion specimens were designed and additive manufacturing manufactured. The mechanical properties were tested and compared with the computational results.

152 Graphene-incorporated hyaluronic acid-based hydrogel as a controlled Senexin A delivery system

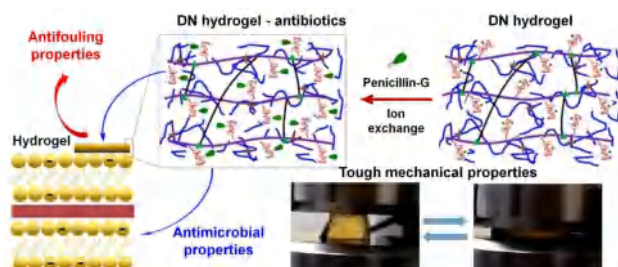
Panita Maturavongsadit, Weiwei Wu, Jingyu Fan, Igor B. Roninson, Taixing Cui, Qian Wang



This study demonstrates a novel biodegradable graphene-incorporated hyaluronic acid-based hydrogel that can effectively accommodate and deliver the cyclin-dependent kinase 8/19 inhibitor Senexin A to the adventitia of vessel grafts without any observed toxicity *in vitro*. The versatility of this hydrogel system supports its potential translation as a perivascular drug delivery system for treating occlusive vascular diseases.

162 Antifouling and antimicrobial cobaltocenium-containing metallopolymer double-network hydrogels

Hui Li, Peng Yang, JiHyeon Hwang, Parasmani Pageni, Alan W. Decho, Chuanbing Tang



Metallopolymer double-network (DN) hydrogels, composed of a first network of cationic cobaltocenium polyelectrolytes and a second network of polyacrylamide, are fabricated via two-step free radical polymerization. After installation with antibiotics, the hydrogel conjugates show remarkable mechanical ability, antifouling and antimicrobial properties.