Converging technologies in biomaterial translational research

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In the realm of scientific innovation, the study of biomaterials emerges as a field of profound significance, bridging the gap between theoretical exploration and translational application.[1] The essence of biomaterial research lies not only in understanding the intricate relationships between biological systems and materials but more importantly, in the translational potential these materials hold.[2] The true value of this research unfolds in its application - from regenerative medicine to bioengineered solutions, where these materials become pivotal in addressing some of the most pressing clinical challenges. Meanwhile, the necessity for translating laboratory research into real-world applications has become increasingly urgent, as global ageing intensifies and public attention to health concerns grows.

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With the rapid evolution of technology, a new paradigm in biomaterial research has emerged, characterised by the convergence of multiple disciplines.[3] This multidisciplinary approach has broken the traditional boundaries of the field, a convergence of insights from nanotechnology, biotechnology, information technology, and cognitive science. This interdisciplinary convergence not only expands the horizon of biomaterial research, but also poses unique challenges and unprecedented opportunities, driving innovation on an unprecedented scale.

In this issue, we present a collection of papers from different fields of translational biomaterials research. There are four review articles: the first, by Han Liu and co-authors,[4] discusses the therapeutic potential of organoid extracellular vesicles in bone therapy, emphasising their physiological effects, biological functions, and biocompatibility; the second, by Yunke Jiao and co-authors,[5] focuses on the advancements in neuroelectrode materials and technologies for brain-computer interfaces, emphasising the critical aspects of biocompatibility, signal quality, and durability for improved system performance; the third, by Chen-Hui Mi and co-authors,[6] reviews the use of polyhydroxyalkanoates in musculoskeletal system applications, discussing their biocompatibility, biodegradability, and potential in tissue engineering and regeneration; the fourth, by Long Bai and co-authors,[7] examines the role of bioactive elements like zinc, magnesium, and silicon in bone regeneration, focusing on their impacts on osteoimmunomodulation, neuroregulation, and angiogenesis, highlights their integration into biomaterials as a promising approach in bone tissue engineering.

Additionally, this issue presents two original research articles, including the development of a rapid method for harvesting mesenchymal stem cells from osteo-organoids, resulting in a high yield of mesenchymal stem cells with enhanced stemness and anti-senescence properties, marking a significant advancement in regenerative medicine;[8] a comprehensive investigation on magnesium-doped polylactic acid microspheres for bone regeneration, highlighting their enhanced biocompatibility, osteogenic activity, and anti-inflammatory properties.[9] Moreover, three commentaries shed light on the most advanced research techniques shaping the field today. Among the highlights are explorations into artificial intelligence accelerated discovery of self-assembling peptides, early immunomodulation by magnesium ion: catalyst for superior osteogenesis and exploration of minimal invasive biodegradable poly(glycerol-dodecanoate) nucleus pulposus scaffold with function regeneration.[10-12] The convergence of these technologies symbolises the rapidly evolving landscape of aforementioned four major scientific domains and represents a technological revolution in biomaterials.

At the forefront of this transformative era, the landscape of biomaterials in translational research presents both thrilling prospects and formidable challenges. The converging technologies in biomaterials translational signal a shift towards more innovative and effective solutions in clinical treatment, through enhancing drug delivery systems, improving tissue engineering methodologies, and more responsive biosensors. Nevertheless, these advancements also bring intricate ethical considerations regarding patient safety and privacy, rigorous regulatory landscapes that ensure product efficacy and safety, and the need for extensive interdisciplinary collaboration to navigate the complexities of these innovations effectively. This scenario calls for a harmonious blend of scientific expertise, ethical understanding, and global cooperation.

In conclusion, as *Biomaterials Translational* embarks on its new journey at Shanghai University, China, the development of the journal is entering its new phase. Our dedication to the founding principles of the journal remains unwavering. We are committed to delivering the latest research findings and in-depth academic insights to our esteemed readers, continuing our legacy of interdisciplinary collaboration in the field of biomaterials science and translational research. Our goal is to provide an exceptional platform for the exchange and exploration of ideas in biomaterials translation, fostering a bridge between scientific discoveries and practical applications, and collectively advancing the ongoing development and innovation in this dynamic field.

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