# Editorial

Hossein Hosseinkhani

Graduate Institute of Biomedical Engineering,
National Taiwan University of Science and Technology,
Taipei 10607, Taiwan
Fax: +886-2-27376544
E-mail: hosseinkhani@yahoo.com

**Biographical notes:** Hossein Hosseinkhani received his BEng in Chemical Engineering from Polytechnique University, and PhD degree in Polymer Chemistry from *Kyoto University* in 2002. Thereafter, he was offered the prestigious JSPS Fellowship of Japan (2002–2004), at *Institute for Frontier Medical Sciences*, Kyoto University Hospital to extend his concepts and to develop stem cells technology based on drug delivery systems for tissue engineering applications. He was selected as ICYS research fellow of Japan (2004–2008) because of his creative research in biomaterials science fields (ICYS: *International Center for Young Scientists*, Notational Institute for Materials Science). He was Senior Research Fellow at *International Research Institute for Integrated Medical Sciences*, Tokyo Women's Medical University, Japan (2008–2009), Visiting Scientist at Center for Biomedical Engineering, *Massachusetts Institute of Technology* (*MIT*), USA (2007–2009). In August 2009, he joined Department of Biomedical Engineering, *National Yang-Ming University*, Taiwan, as an Associate Professor and thereafter at Graduate Institute of Biomedical Engineering, *National Taiwan University of Science and Technology*. His research interests include biomaterials, drug delivery system, gene therapy, 3D *in vitro* systems, bioreactor technology, and bioengineering stem cells technology.

Nanomedicine is the medical application of nanotechnology and related research. It is multi-interdisciplinary in nature and brings together the fields of chemistry, pharmaceutical science, biology, and basic and clinical medicines by focusing on design and preparation of biodegradable or non-biodegradable biomaterials for their biological, medical, and pharmaceutical applications. Combinational technology of biology and engineering is emerging as an integral aspect of today's advanced medicine to provide technology for imaging, cancer treatment, medical tools, bone treatment, drug delivery, diagnostic tests, drug development, and angiogenesis that are all in the field of nanomedicine. The aim is to exploit the improved and often novel physical, chemical, and biological properties of materials at the nanometre scale. Nanomedicine has the potential to enable early detection and prevention, and to essentially improve diagnosis, treatment and follow-up of diseases. Diagnostics, targeted delivery and regenerative medicine constitute the core disciplines of nanomedicine [1–3]. It covers areas such as nanoparticle drug delivery and possible future applications of molecular nanotechnology (MNT) and nanovaccinology. It is committed to supporting such activities as theranostics, where nanotechnology will enable diagnostic devices and therapeutics to be

combined for a real benefit to patients. Rapid development of nanomedicine will open many gates to new areas of medical technology [4,5]. These include several aspects of materials technology in combination with biology to create an environment where chemists and biologists can communicate with one another on theory, methodology, design of experiments and the end results so that fruitful collaborations and training in advanced medical technology can be established.Recently, many researchers have considered applying nanomedicine technology as a powerful method in stem cells technology to overcome many limitations in clinical application of stem cells, such as migration of stem cells after *in vivo* transplantation in the body. Our recent results have indicated biodegradable nanoparticles have great capacity as tracking agent to transfect stem cells for regenerative medicine therapy [6]. Therefore long time tracking of stem cells by nanoparticles that transfect stem cells and can be easily tracked will answer many current questions in tissue engineering applications. Alternatively, our research indicated these nanoparticles have many other applications in targeted delivery system such as cancer treatment [7–9]. Biochip technology in combination with nanomedicine is rapidly under development as one of the great discoveries in the history of biological sciences to be used as platform technology for application in fundamental biology, improved tools and assays, drug discovery, regenerative medicine, drug delivery, and diagnostics tools. Combinational technology of scaffolding materials and nanotechnology is promising in the development of tissue engineering. Many researchers including our group have widely used tissue engineered nanoscaffolds for tissue regeneration [10–13]. With nanotechnology industries booming, the entire system of medical technology is to be rewritten. Safe, effective, without side effects, no wastage, and increased bioavailability are going to be the mantras of future medical treatment. Nanomedicine is a large industry, with nanomedicine sales reaching 6.8 billion dollars in 2004, and with over 200 companies and 38 products worldwide. Moreover a minimum of 3.8 billion dollars in nanotechnology R&D is being invested every year. As the nanomedical industry expands at a fast pace it is expected to have a great impact on our economy [14]. This special issue features a selection of 'Nanotechnology Research in Biological Systems'; so-called *Nanomedicine*. Both contributed and invited papers cover a broad range of topics. We thank all the authors and reviewers for their contributions and efforts. We greatly appreciate the efforts of the invited contributors to the special issue.

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