

Nanomedicine – bridging the gap between nanotechnology and medicine

Dear Readers

“There is plenty of room at the bottom. Many of the cells are very tiny, but they are active: they manufacture substance; they walk around; they wiggle: and they do all kinds of marvelous things - all on a very small scale. Also they store information. Consider the possibility that we too can make things very small which does what we want when we want - and that we can manufacture an object that maneuvers at that level.”

Richard P. Feynman

Nobel Laureate in Physics in 1965

The application of science and technology at the nano-scale is redefining fields like imaging, diagnosis, drug delivery, regenerative medicine and biomaterials as well as underpinning the development of new generations of medical products. Many of these advances would offer vastly improved outcomes for patients, therapies for hitherto difficult-to-treat diseases or conditions, improved manufacturing efficiency, and better use of valuable medical professional resources. The technology has already found its way into multifarious applications in healthcare such as diagnostic imaging agents, drug delivery systems, pathogen detection systems, biosensors, tissue engineering, microfluidics, lab-on-a-chip, compact electronic systems.

What makes nanotechnology so important is its capability to assist researchers and scientists understand many diseases on submicron level, leading to new insights and discoveries in diagnostics and therapy and contributing to the development of new generations of medicinal products. This unique capability is invigorating the demand for nanotechnology in medicine to help tackle many of today's challenges in healthcare. As we understand more and more about the origins of disease, from our increasing knowledge of how the body works at the nano-scale, the application of nanotechnology is already beginning to affect the practice of medicine in radically new ways.

In recent years, many big programmes have been initiated by Governments as well as industries in order to accelerate the growth of nanotechnology and to better understand and treat diseases. Some of the key players in the field include the European Union (the biggest public investor in nanotechnology research) and the US Government from the public sector, and Philips Healthcare, Siemens Medical Solutions, GE Healthcare, AstraZeneca and GlaxoSmithKline from the private sector.

Medicine is going through a period of great change. Nanotechnology is now revolutionising medicine in the 21st Century. However, only very few people receive specific trainings in both medicine and nanotechnology or how nanotechnology is likely to impact new medical products,

drug discovery and delivery, or the practice of medicine utilising nanotechnology. There appears a major skills and knowledge gap between nanotechnology and medicine. As a result of the increasing demand and awareness of applications of nanotechnology in medicine, a new discipline namely nanomedicine has emerged and is now growing at a rapid rate every day-already solving many challenges faced within various professional bodies, such as healthcare systems, government agencies and industrial companies.

Currently, nanomedicine is already a very large industry which is growing very fast every day, with more than 40 products and more than 200 companies dedicated to this field. Only in 2005 the nanomedicine sales reached 6.8 billion dollars against a minimum of 3.8 billion invested every year on this field. In April 2006, the journal *Nature Materials* estimated that 130 nanotech-based drugs and delivery systems were being developed worldwide. For that experts are expecting a significant growing of the nanomedicine in the forthcoming years which directly impact the world wide economy. Professionals involved in the research and development of nanomedicine include mathematicians, engineers of all fields, computer science and IT professionals, physicians, chemists and biologists.

Cranfield University, one of Europe's foremost providers of postgraduate and continuing professional education, and the Institute of Nanotechnology, an acknowledged leader in nanotechnology information, and have teamed up to successfully deliver a unique series of short professional courses in Nanomedicine worldwide for many years.

Furthermore, the first M-level postgraduate course of Nanomedicine in Europe was timely and successfully launched by Cranfield Health at Cranfield University in 2009. The course, formulated and led by Dr. Yi Ge, is designed to fill the major skills and knowledge gap between medicine and nanotechnology, and provides graduates, researchers, clinicians and healthcare professionals with an advanced knowledge, skills and practical experience of the principles, technology and applications in this newly emerging interdisciplinary field.

Delivered by leading academics in unrivalled facilities, this unique course provides relevant training for students and professionals who have acknowledged this shift in emphasis and are prepared to take up the many challenges and opportunities that it offers. It provides essential training for new graduates in the nanotechnology and medicine arena, and will naturally follow on from a first degree in science and technology. In particular, it timely responds to an increase in the demand for highly skilled individuals in industrial research and development roles as well as regulatory roles. The course also provides advanced in-post training for professionals already working in a variety of

related industries and it is available on a full and part-time basis the course offers flexibility and support for those who wish to study whilst remaining in employment.

Nanomedicine will become more and more important to improve healthcare in all phases of the care process. There is no doubt that a very bright future lies ahead for it.

With kindest regards,



Yi Ge, PhD
Associate Editor



Ashutosh Tiwari, PhD
Editor-in-Chief



Songjun Li, PhD
Editor-in-Chief