New Drugs in the Past and New Drugs in the Future

a report by
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Professor Kinam Park is currently President of the Controlled Release Society for the 2001–2002 term. He is also Professor at the Departments of Pharmaceutics and Biomedical Engineering of Purdue University. Professor Park is currently Associate Editor and Book Review Editor of the journal *Pharmaceutical Research*, and a member of the editorial boards of the *Journal of Biomaterials Science-Polymer Edition*, *Journal of Bioactive and Compatible Polymers*, *Journal of Controlled Release*, *PharmSci*, *Archives of Pharmacal Research*, *Colloids*, *Surfaces B: Biointerfaces* and *PharmSciTech*. He became a Fellow of the American Association for Pharmaceutical Scientists in 1993, of the American Institute for Medical and Biological Engineering in 1996, and of the Biomaterials Science and Engineering of the Society for Biomaterials in 2000. He has received various awards and was recently a recipient of the Clemson Award (the Basic Research Category) from the Society for Biomaterials in 2001, and the Research Achievement Award in Pharmaceutics and Drug Delivery Section from the American Association of Pharmaceutical Scientists (AAPS) in 2001. Professor Park received his PhD in Pharmaceutics from the University of Wisconsin in 1983.

The global pharmaceutical market is known to be worth about US$400 billion. Undoubtedly, the pharmaceutical business is one of the most economically important to society. While sustained development of new drugs that treat many diseases remains the key to the continued growth and successes of the pharmaceutical industry, the nature of 'new drugs' has been changing slowly. Most of the new drugs we have seen in the past are those that are delivered to the body to increase the drug concentration throughout. In the future, however, new drugs will work in different ways. Many new drugs that will be developed cannot simply be administered to the whole body. For example, drugs for inhibiting angiogenesis cannot be administered to elevate the concentration throughout the body; they must be delivered only to the target site. In another example, the success of gene therapy will depend on the effective delivery of the genes to the target cells only. Three articles in this business briefing deal with the timely topic of localised and targeted gene delivery.

While there is no doubt that discovery of new drugs is most important, drug delivery becomes as important as the drugs themselves. Without suitable delivery vehicles, many drugs will not be as useful as they can be. The importance of drug delivery is not limited to the new drugs that will be developed in the future. Drug delivery is still important for existing drugs. Easy examples are poorly soluble drugs and protein drugs. The poor solubility of many important drugs limits their clinical applications. Drug delivery systems that can increase the water solubilities of poorly soluble drugs by orders of magnitude will be critical for more effective use of existing drugs. Delivery of protein drugs requires daily injections in most cases. While development of protein drugs with long half-lives is underway, the current approach of long-term delivery of protein drugs is based on microencapsulation into biodegradable polymers. The contemporary micro-encapsulation methods are not well suited for scale-up mass production. Development of new, simpler microencapsulation technologies will be the key to more effective use of current and future protein drugs.

Controlled Release Society (CRS) is the key scientific organisation that focuses its entire efforts to promoting the science and technology of controlled release. CRS will be holding its 29th annual meeting in Seoul, Korea, between 20–25 July 2002. The mini-symposium is divided into disease-based drug delivery, such as drug delivery for cardiovascular disease treatment, for neoplastic disease treatment and for diabetic disease. The scientific sessions are classified into biomaterials for drug delivery, biomimetic polymers for drug delivery, chemical characterisation and imaging of drug delivery, drug delivery in osteogenesis, intracellular trafficking, particulate drug carriers and PEGylated protein drugs, tissue engineering and therapeutic gene/oligonucleotide delivery. The three plenary speakers at the Seoul meeting will present lectures on the most timely topics relevant to drug delivery, for example microarray analysis of mechanically induced gene expression in vascular cells, new concepts of cell biology, polymer gel phase transition as a central mechanism in biology, and gene delivery research as a clinically useful tool. The members of the CRS have been working on developing new drug delivery technologies to bring concept into reality for various types of drugs.

Drug delivery technologies have been developed over the last three decades. In the 1970s and 1980s, the urgent needs were to develop zero-order release drug delivery systems and systems that allow exact control, or at least understanding, of the release kinetics from dosage forms. Research in the 1990s produced the ability to achieve modulated drug delivery using so-called smart polymers and hydrogels. In addition, delivery systems for protein drugs and genes began to emerge.

What the future will bring in drug delivery technology is anybody's guess, but, if history is any guide, we can assume that, in less than a decade, the difficulties associated with current drug delivery challenges will be overcome. To reach that point, it is important for drug delivery scientists to congregate once a year to present their works, exchange ideas and explore different concepts. This year, Seoul will provide such a forum not only for CRS members, but for all scientists working in the pharmaceutical field. I look forward to seeing you in Seoul in July. ■