J Mater Sci: Mater Med (2006) 17:1191–1192
DOI 10.1007/s10856-006-0591-y

Editorial

Andrew W. Lloyd

The 10th International Conference on Polymers in Medicine and Surgery (PIMS) was held in historic city of Cambridge in September 2004. Cambridge has retained the ambience of an English, medieval town, whilst continuing to contributing to some of the most recent scientific advances of modern times. The combination of the old and the new, an ancient heritage and modern facilities, made Cambridge the ideal venue for PIMS 2004. The meeting focussed on the latest development of polymeric materials for medical applications through a series of invited lectures, posters and oral presentations. It provided an exceptional opportunity for clinicians, researchers and industrialists from a range of disciplines in this field to network in an academically conducive environment.

The application of novel polymers in medicine and surgery has increased dramatically in recent years as material scientists seek to find improved medical plastics for extracorporeal systems, blood bags and disposables and develop novel medical implants and drug delivery systems. The proceedings of previous PIMS conferences track the development in polymers in medicine and surgery as polymer technology and the development of knowledge has developed to allow a much wider application of polymeric materials in these disciplines. Increasingly there has been less consideration of the use of existing polymers for medical device applications, such as the use of poly(vinyl chloride) (PVC) for extracorporeal applications and high density polyethylene (HDPE) as hard wearing components for the fabrication of hip and knee implants and more consideration of the development of specifically tailored materials for specific biomedical applications.

The recent development in synthetic chemistry allows the synthesis of polymers with controlled molecular architectures. This provide unique families of materials for the development of a wide range of novel self-assembling, biocompatible coatings, bulk materials and gels for drug delivery and medical implant applications. The development in our understanding of biological interactions at polymer surface and the analytical techniques for monitoring the changes in interfacial surface chemistry in a biological environment has allowed the development of polymers which interact in more predictable and desirable way with biological systems than was previously possible. Finally the developments in surface bioengineering which allows the engineering of a surface to achieve the desirable host response whilst retaining the mechanical or physical properties of the underlying substrate has allowed biomedical material scientists to capitalise on the developments in both the synthesis of polymers and the understanding of biological system to improve the performance of existing materials. It is now possible to graft polymeric materials with unique biological properties to either enhance or reduce biological interactions to a wide range of metallic and non-metallic substrates. These coatings can be engineered to be passive, active or bioresponsive depending on the nature of the desired biological response.

The other area of significant development in recent years has been the increasing demand for combination devices where pharmacological agents are incorporated into medical devices as a means of reducing complications or enhancing tissue integration. The new generation of medical implants are likely to include both prophylactic agents, such as antibiotics to minimise postoperative infections, and active agents to control wound healing response or tissue integration. The challenges of delivering drugs from the surfaces, or bulk, or a medical device are significant if we are to achieve the desired biomedical responses whilst seeking to avoid local toxicity. This is leading to the development of novel materials which

A. W. Lloyd
Chair, PIMS2004

provide for controlled release of materials in a predictable way in biological tissue. The ability to molecularly engineer polymers provides a myriad of ways of controlling the release of pharmacological agents and offers opportunities for passive, active and bioresponsive drug release depending on the nature of the application. An exciting application of such technology is the combination of embolisation approaches with controlled drug delivery of anti-cancer agents to achieve the advantages of both the embolism of the tumour and site specific targeting of cytotoxic agents to the tumour mass.

All these interventions provide opportunities to significantly improve healthy ageing of populations across the world by reducing the requirements for post-operative surgery or more effective treatment of disease. Improvements in the longevity of existing medical implants will also alleviate the increasing requirements for revision surgery required to support by a more health ageing population. Furthermore these developments have the potential to have significant economic benefits through the reduction in primary and secondary healthcare costs and the ability to ensure that individuals are more able to continue to contribute to society and the economy in their later years.

PIMS 2004 sought to bring together specialists in the use of polymers for medical device, drug delivery and implant applications to discuss these latest innovations and exchange new ideas within this rapidly evolving field and this special issue provides an insight into some of the presentations at this meeting. The broad range of presentations, which covered the entire spectrum of topics highlight above, demonstrated the increasing importance of polymers in medicine and surgery.

The rapid and exciting developments of a number of these areas since the last PIMS conference will mean that the next meeting, which is being held as part of the European Society of Biomaterials Meeting (ESB2007) in Brighton, UK in September 2007 will be of even wider interest to scientists, industrialists and clinicians in this field—I hope you will be able to contribute to the academic discussion of this rapidly expanding field of polymers in medicine and surgery by attending PIMS2007.