Editorial: Hydrogels and hydrocolloids—part of the symposia program of the 7th world biomaterials congress, May 17–21, 2004, Sydney, Australia

Hydrogels as biomaterials cover an extremely broad variety of chemical composition, principles of formation, and practical medical, biological and pharmaceutical applications. They range from irreversibly/chemically cross-linked synthetic polymeric materials to reversibly/ electrostatically bridged biopolymers manufactured into different shapes and dimensions including macroscopic devices as well as colloidal preparations (hydrocolloids). They are known as materials, which are absolutely stable over a long period, or on the other hand, can be formulated in such way that they become degradable in a specific controllable manner. A multitude of variations within the frame of the limiting cases shortly summarized above have been reported during the last four decades.

While hydrogels were, of course, the topic of many oral and poster presentations during the 7th WBC, two of the forty-five symposia were specifically dedicated to hydrogels based on natural materials. These were Symposium 19 "Hydrogels and Hydrocolloids—Hyaluronan and Derivatives" (one session with seven oral contributions) and Symposium 20 "Hydrogels and Hydrocolloids—Alginate and other Biopolymers" (three sessions with nineteen oral contributions). Approximately twenty-five posters completed these sessions.

Thirteen articles reporting recent research, novel application studies, and scientific progress, but also addressing remaining challenges have been selected for this special issue. The majority of them deal with alginate used for cell encapsulation, scaffolds, or extracellular matrices either ionically cross-linked with multivalent ions or polyions, or additionally covalently connected subsequent to modification. During the last decade there has been an increasing interest in the use of alginates in biotechnological, biomedical and pharmaceutical applications. This biopolymer has advanced to one of the most preferably employed components of hydrogels to entrap cells and tissue for immunoprotection/immunoisolation or guided cell/nerve growth. Potential applications are for example the treatment of Parkinson's disease, chronic pain or the encapsulation of insulin-secreting cells for long-term treatment of diabetes. Although alginate biocompatibility has been extensively investigated, there is still disagreement in the scientific community. To a large extent the frequently reported non-reproducibility of *in vitro* and *in vivo* experiments results from insufficient consideration of materials characteristics and/or missing standardization. As a consequence, in addition to application studies of alginate-based hydrogels, basic studies to establish the missing relationships are in progress in several groups. This concerns, for example:

- The development of effective purification methods to exclude the influence even of traces of impurities.
- The application of suitable characterization methods to analyze the network structure and the surface structure of hydrogel networks.
- The examination and documentation of interrelations between materials properties and body response at various transplantation sites.

All these points, and much more, have been intensely discussed during the two days when the symposia took place. Indeed, the symposia were not limited to alginate. Further biopolymers employed as components of hydrogels were chitosan, hyaluronate, and hyaluronate derivatives with applications as membranes, bone cement components or for surface modification. Finally, controlled network formation principles were debated, which combine physical and chemical cross-linking mechanisms in order to equip the ultimate material with tailor-made properties.

The strong interest in the field became obvious from the number of participants in the sessions, sometimes exceeding the number of seats available. This interest has motivated the edition of this special issue, thus making the contributions accessible for scientists who could not participate in the congress. In general, it may be concluded that the importance of natural polymers as well as modified biopolymers as components of hydrogels will increase, in particular, if they can be provided highly pure and with standardized characteristics allowing an excellent reproducibility of the hydrogel network formation process. In addition, more and well-defined biomolecule structures, replacing natural products, are expected from progress in biotechnology.

As the organizer of Symposium 20, I would like to thank all presenters who contributed to the success of the sessions and subsequently elaborated their contributions for this issue. Particular thank is addressed to Medipol SA (www.medipol.ch) for their sponsorship.

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