Tony Mikos's Fundamental Contributions to Bioadhesion and How They Led to Today's Understanding of Cell and Mucus Adhesion of Biomaterials

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Bioadhesive and cytoadhesive hydrogels have a wide range of applications in the biomedical field. Such hydrogels help to target biomaterials to specific areas of the body and to increase their residence time, thus enhancing their beneficial properties. Mikos' work from 1985-88 defined the molecular principles of bioadhesion using probabilistic theories and detailed analysis of the polymer/tissue interactions. His results allowed concentration on the use of active tethered structures to improve interaction with biologically relevant surfaces. The focus of our present research is the modification of hydrogel surface properties by using tethered polymer chains to achieve promotion of muco-and cytoadhesion. Tethered polymer chains investigated here include star polymers, comb polymers, block copolymer chains and chains ending in in specific peptidic structures. We have studied and will present results of the function of tethered polymer chains in contact with mucin, Caco-2 and other cell lines, intestinal and other tissues. Using fluorescent spectroscopic, surface force measurement, and tensiometric studies, we examine and optimize the structure of the tethered chain.