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Synthesis & applications of derivatives of polyethylene glycol (PEG)

While biomaterials have been used for many years, there have important recent developments in the field. Biomaterials are named for their ability to replace or restore biological functions and exhibit compatibility with the biological environment [Drotleff, 2004]. While new developments in biomaterials have been associated with tissue engineering, other recent advances include the use of biomaterials as cellular carriers and for drug delivery. One of the most frequently used biomaterials is poly(ethylene glycol) (PEG). The frequent use of PEG may be attributed to its unique physical and chemical properties. These properties may be altered by varying the molecular weight or by chemical functionalization. PEG derivatives exhibit great potential for novel biological applications, such as the use of PEG-carbohydrate conjugates for clinical applications. However, such PEG derivatives are currently quite expensive. Therefore, the development of practical methods for the preparation of PEG derivatives is potentially of wide applicability. During the Fall of 2007, I began to examine the correlation between varying the molecular weights of PEG conjugates and their effects on a model system for intestinal permeability. I synthesized derivatives of PEG samples of varying molecular weight. I then analyzed the PEG samples using nuclear magnetic resonance (NMR) spectroscopy to monitor synthetic transformations. Future research involving PEG shows great potential and may lead to promising medical developments in the near future. The possibilities of varying molecular weight and exploring the functionalization of polymers are endless, going far beyond what I have done at this time.

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