Spectrophotometric method to measure degree of functionalization of arginine-functionalized chitosan

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Research Experiences for Undergraduates

Chitosan is an abundant and bio-compatible polymer derived from chitin. Functionalizing chitosan with the amino acid arginine has been previously demonstrated to enhance the solubility and antibacterial properties of chitosan, and there is also reason to believe that functionalizing chitosan with a guanidine group will provide similar desired effects. However, traditional techniques of measuring molecular weight distributions using dynamic light scattering do not sufficiently measure the degree of functionalization of such products.

Undergraduate student Margaret Ho (Harvey Mudd College) developed a procedure based on a previous paper[1], for synthesizing and extracting a UV-sensitive arginine derivative, which should also work as a tag for guanidine. Using Beer's Law, the measured UV absorbance at 315 nm of the product against concentration enables the calculation of the extinction coefficient.

[1]King, T.P *Selective Chemical Modification of Arginyl Residues,* Biochemistry, Vol 5. No.11, November 1966

The hope is that by performing the reaction and extraction on arginine-functionalized or guanidine-functionalized chitosan and using the calculated extinction coefficient to correlate UV absorbance with concentration, it will provide a standard method for determining degree of functionalization.

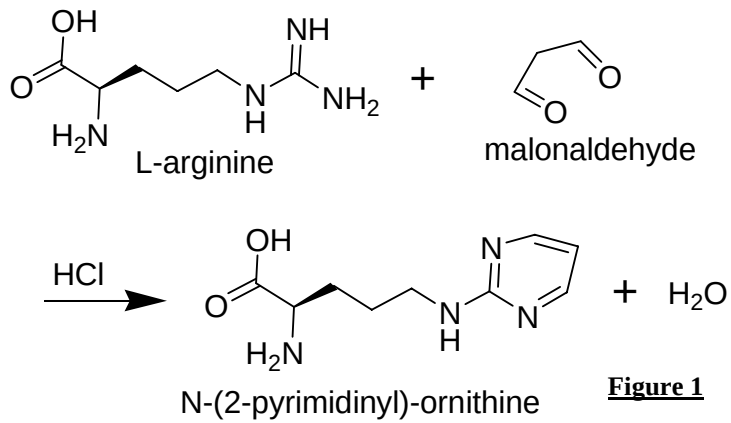

Figure 1

Synthesis of guanidine tag and suspected product

Further research will focus on characterizing the UV-sensitive arginine derivative and to perform the reaction on guanidine and arginine-functionalized chitosan derivatives.