Calcium Alginate and Polyacrylamide Hydrogels as Drug Delivery Devices

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A possible biomaterial as an alternative method of drug delivery is the hydrogel, a polymer-network with crosslinking and absorbing properties. The purpose of this experiment is to evaluate the efficacy of hydrogel as an oral drug delivery device assessed through absorbance measurements of E. coli bacterial growth using spectrophotometry. The hypothesis is that hydrogels will perform effectively as a drug delivery device. Absorbance values were measured for bacterial growth in the presence of calcium alginate or polyacrylamide hydrogel containing either ampicillin or kanamycin antibiotic or distilled water for the control. A curve was created of a bacteria culture as a standard of comparison for the experimental absorbance values. Trials were also performed to see the effect of placing the hydrogel into CaCl2 and sodium citrate solutions each for 24 hours separately. The standard bacterial growth curve showed rapid growth. The trials completed using ampicillin and kanamycin contained in the hydrogel for both calcium alginate and polyacrylamide showed almost complete inhibition of E. coli growth with 0.04 AU as the highest absorbance reading, indicating effective transport. Hydrogel left in CaCl2 and in sodium citrate for 24 hours did not show substantial deviation from each other and were intermediate between the bacterial growth curve and the samples tested immediately after formation, supporting time release properties. Two conclusions were found: 1. Hydrogels are effective drug delivery devices due to their ability to absorb, retain, and release a drug molecule; and 2. Hydrogels have time-release properties. Hydrogel can hold the antibiotics for extended periods of time, not degraded by acid, and can be put into pill form, which is ideal for drug delivery.

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