Building a Multilayered Hydrogel Microsphere Crosslinked by Genipin for Controlled Dissolution in Drug Release

An, Christina (School: Palos Verdes Peninsula High School)

Recently, microspheres have been receiving a lot of attention for their significance in the local release of drugs. This experiment sought to create a multilayered, biocompatible hydrogel microsphere by using natural ingredients including gelatin, olive oil, and genipin which is extracted from the plant Gardenia jasminoides Ellis. The hypothesis for this experiment is: if genipin is used as a crosslinking agent, then a multilayered microsphere, where the rate of dissolution is controlled, can be efficiently created. Microspheres were built by using a new water-in-oil emulsion technique using olive oil as a base and cyclopentasiloxane, as a surfactant. Different food colorings were used to distinguish the different layers of each microsphere. The small particle was then stabilized every time a new layer was added by crosslinking with genipin. Degrees of crosslinking were determined by the incubation time inside the genipin solution. Release rates were studied using a microscope and the dispersion of each colored layer was timed. When the microspheres were tested, it showed that different layers would be released at different times. When timing the complete dissolution of the microspheres, there was a clear link between the percentage of crosslinking and the time the microsphere took to completely dissolve. There seems to be an almost exponential relationship between the percentage of crosslinking and dissolution time period. The success rate for creating a genipin microsphere was 100%, while the success of creating a distinct second layer was 90.02%, and the success of creating a third layer was 86.65%. In conclusion, this experiment supported the hypothesis through the production of biocompatible multilayer hydrogel microspheres cross linked with genipin.

Awards Won: