



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Hyokyung An	Project Number S0601
Project Title Building a Multilayered Hydrogel Microsphere Crosslinked by Genipin for Controlled Dissolution in Drug Release	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals 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 <i>Gardenia jasminoides</i> 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.</p> <p>Methods/Materials Microspheres were built by using a new water-in-oil emulsion technique using olive oil as a base and ABILEM 90, 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. The various rates of crosslinking ranged from 5% to 60%. Each level of crosslinking had six trials.</p> <p>Results 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. 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%.</p> <p>Conclusions/Discussion In conclusion, this experiment supported the hypothesis through the production of biocompatible multilayer hydrogel microspheres cross linked with genipin. With a multilayered microsphere created, this improves the medical field vastly by allowing patients to receive better care with more innovative medical practices. This experiment also proved that a water-in-oil emulsion technique is applicable when creating a hydrogel microsphere.</p>	
Summary Statement I created a process for creating a multilayered gelatin-oil hydrogel microsphere by using genipin as a crosslinker by using a water-in-oil emulsion technique.	
Help Received I paid for a 3 month membership for TheLab to access the lab and its equipment. Melissa Draeger and Cory Tobin helped to place orders for chemicals and taught me how to use certain equipments safely. I independently sought this lab out and independently worked on the trials.	