LURING: Periodic Precipitations for the Controlled Release of Drugs

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Drug Delivery Systems, DDS are systems that allow the controlled release of a given active ingredient with the aim of improving the effectiveness of drug treatment and reducing the toxicity of a therapy. Experimentation has made it possible to predict and control the process of periodic precipitation by studying the operational variables that regulate the formation of Liesegang rings and to apply this rhythmic precipitation to the design of a pulsating delivery system for single drugs (Acetylsalicylic acid) or drugs encapsulated in zinc oxide nanoparticles (ibuprofen). Liesegang rings are self-organizing phenomena that develop spontaneously in systems far from equilibrium, creating a precipitation reaction characterized by the formation of structures consisting of rings. The first experiment of periodic precipitation was carried out with the copper hydroxide system in 1% agar gel. The second periodic precipitation experiment was carried out with the calcium hydrogen phosphate ($CaHPO_4$) system in agar gel. The effect of the reaction parameters in the synthesis of Liesegang rings shows that the distance between the rings gradually increases with increasing distance of the ring from the gel interface. It was also noted that the ring width increases with increasing ring distance from the gel interface. From all the data collected and the analyses performed, it is confirmed that the drag delivery of drug molecules by means of Liesegang rings works well with rings made from $CaHPO_4$ and the release of ibuprofen and Acetylsalicylic acid.

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