Abstract:

For many pharmaceutical applications, it is important that different drugs are present in the human body at distinct timepoints. Typically, this is achieved by a sequential administration of different therapeutic agents. A much easier alternative would be to develop a drug delivery system containing a whole set of medically active compounds which are liberated in an orchestrated and controlled manner. Yet, such a controlled, sequential release of drugs from a carrier system that can be used in a physiological situation is difficult to achieve. Here, we combine two molecular mechanisms, i.e. a build-up of osmotic pressure by the depletion of a control molecule and triggered disaggregation of nanoparticle clusters by synthetic DNA sequences. With this approach, we gain spatio-temporal control over the release of molecules and nanoparticles from a gel environment. The strategy presented here has strong implications for developing complex drug delivery systems for wound healing applications or for the sustained release of pharmaceuticals from a drug-loaded gel and will lower the need for multiple drug administrations.

Stichworte:

Drug delivery; DNA linker; Nanoparticles; Liposomes; Osmotic pressure