

A magnetic field-driven multi-functional “medical ship” for intestinal tissue collection *in vivo*

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The incidence of intestinal cancer has risen significantly. Because of the many challenges posed by the complex environment of the intestine, it is difficult to diagnose accurately and painlessly using conventional methods, which requires the development of new body-friendly diagnostic methods. Micro- and nanomotors show great potential for biomedical applications in restricted environments. However, the difficulty of recycling has been a constraint in the collection of biological tissues for diagnostic purposes. Here, we propose a multi-functional “medical ship” (MFMS) that can be rapidly driven by a magnetic field and can reversibly “open” and “close” its internal storage space under NIR laser irradiation. It provides a transportation and recovery platform for micro- and nanomotors and cargoes. In addition, fast selection of the MFMS and magnetic nanoparticles (MNPs) can be realized through adjusting the strength and frequency of the external magnetic field. Rapid encapsulation of intestinal tissues by MNPs was achieved using a low-frequency rotating magnetic field. In addition, we demonstrated the controlled release of MNPs using the MFMS and the collection of intestinal tissues. The proposed MFMS is an intelligent and controllable transportation platform with a simple structure, which is expected to be a new tool for performing medical tasks within the digestive system.
