

基于MEMS的消化道定点释药微系统研究

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基金项目:

摘要:

消化道定点释药微系统是一种新型的无创医疗器械,当前主要应用于制药领域中的局部药物吸收研究中,通过无创的消化道内定点药物释放,获得药物在消化道特定位的药物吸收特性数据,用于指导新型口服制剂的开发。本研究研制了一种新型的消化道定点释药微系统,研制的定点释药电子胶囊采用了一种新型的释药驱动器,释药驱动器包括微发热阵列、微型弹性波纹管、活塞,活塞和微发热阵列通过低熔点粘结剂固定,压缩状态的弹性波纹管提供释放药物的驱动力,利用MEMS工艺发热阵列的功耗降低至450 mJ,本研究开发了一种磁标记跟踪系统,通过获得信号源的三维位置数据而获得电子胶囊在消化道中的位置。利用本系统,我们获得了碱在12例志愿者的近端小肠定点释放药物的药代动力学参数。

关键词: 定点释药电子胶囊; MEMS; 微发热阵列; 局部药物吸收; 磁标记跟踪

Design of site-specific delivery capsule system based on MEMS

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Abstract:

Site specific delivery capsule(SSDC) is a new method to realize non-invasive drug delivery to the selected sites of the human gut. With SSDC, non-invasive Regional Drug Absorption(RDA) studies are taken to provide the pharmacokinetics data for oral drug formulation development. In this research, a new SSDC system has been developed based on MEMS technology. A innovative drug release actuator was designed with simple and reliable structure, which include a micro-heater array, a elastomeric bellows and a piston. The power of the compressed elastomeric bellows driven the piston to expelled drug out of the capsule. Piston was adhibited to the micro-heater array by low melting point adhesive. The power consumption of the micro-heater array has been decreased to 450mJ by MEMS technology. A Magnetic Marker Monitoring (MMM) system was developed to monitor the location of the capsule inside the human gut by providing three-dimensional location data. We get the pharmacokinetic characteris data of aminophylline(150mg) in the proximal small intestine of 12 healthy volunteers with the SSDC.

Keywords: Site specific delivery capsule (SSDC); MEMS; micro-heater array; Regional Drug Absorption(RDA); Magnetic Marker Monitoring (MMM)