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Novel β-1,3-D-glucan porous microcapsule enveloped folate-functionalized liposomes as a Trojan horse for facilitated oral tumor-targeted co-delivery of chemotherapeutic drugs and quantum dots

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Preparation of folate (FA)-conjugated chitosan (CS). Briefly, 50 mg FA, 15.6 mg n-hydroxysuccinimide (NHS) and 26.1 mg 1-(3-dimethylaminopropyl)-3-ethyl carbonimide hydrochloride (EDC·HCI) were dissolved in 10mL of dimethyl sulfoxide, and then stirred for 3 h to activate c-COOH groups of FA. Subsequently, 10 mL of 1% (w/v) CS solution was added dropwise into the above dimethyl sulfoxide solution, and the mixed solution was stirred at 35°C in the dark for 16 h. Next, the solution was brought to pH 9.0 by addition of 0.1M NaOH. The product was purified by dialysis (MWCO 3500) first against PBS (pH 7.4) for 3 days and subsequently against distilled water for another 3 days. Finally, the obtained solution was lyophilized at −55°C for 10 h to collect the FA-conjugated CS.

Preparation of GMPs. Briefly, 45 g of Baker's yeast was suspended in 500 mL of 1 M NaOH solution. The suspension was heated at 80 °C for 2 h, and centrifuged at 6000×*g* for 10 min. The centrifugal product was rinsed twice with deionized water, and then dispersed in aqueous solution at pH 4.5, and incubated at 60 °C for 2 h. The sample was collected by centrifugation and thoroughly washed with deionized water to neutral. Subsequently, the obtained sample was rinsed with 100 mL of isopropyl alcohol for three times. After another rinse with acetone, the resulting GPMs were collected by centrifugation and dried under vacuum.

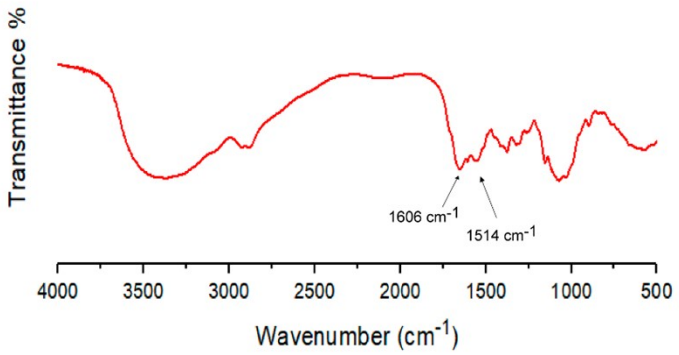

Fig. S1 Fourier transform infrared (FT-IR) spectrum of folate-conjugated chitosan.

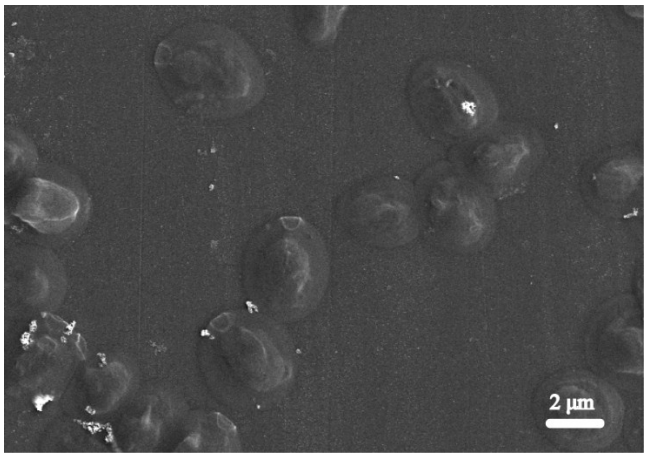

Fig. S2 SEM image of GEF/ZnO-FCL@GPMs placed in a screw-capped plastic bottle after 6 months of storage (25°C, 60% RH).

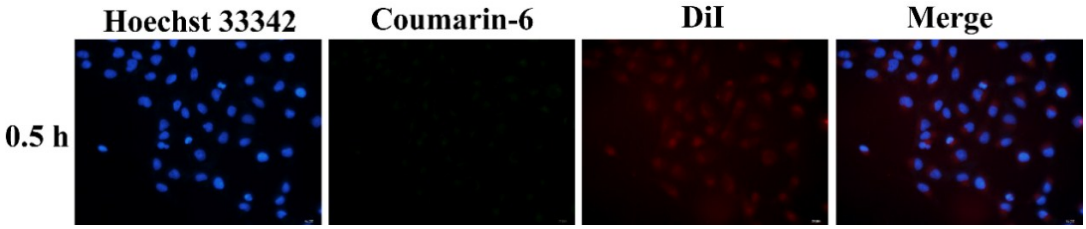

Fig. S3 A549 cells after incubation with the coumarin-6 solution (100 μg/mL).

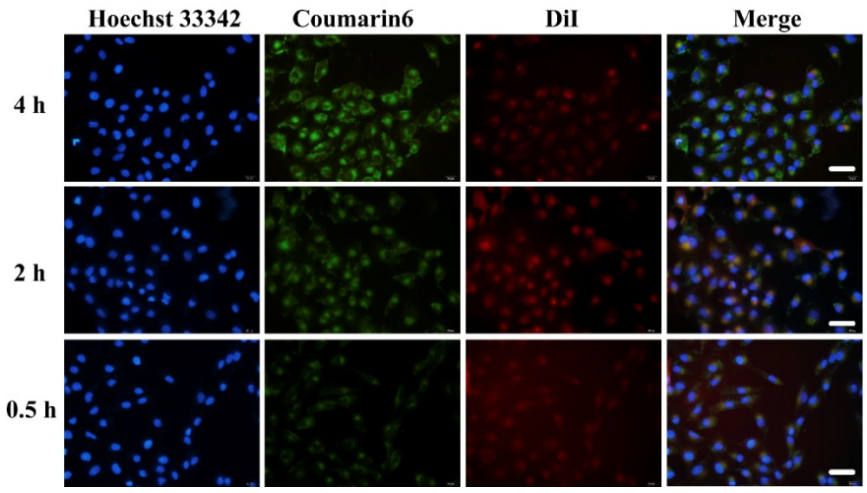

Fig. S4 Fluorescent images of A549 cells after incubation with coumarin-6-loaded FCLs (500 μg/mL) at 0.5, 2, and 4 h.

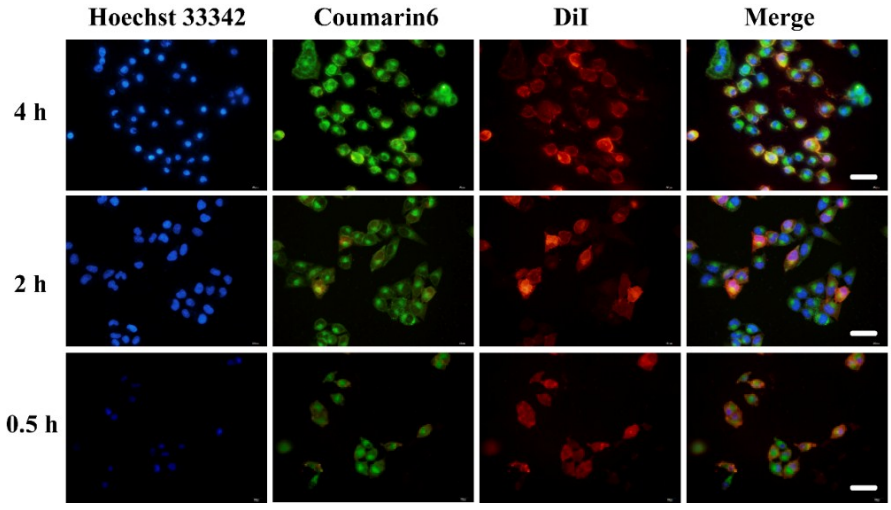

Fig. S5 Fluorescent images of MCF-7 cells after incubation with coumarin-6-loaded FCLs (500 μg/mL) at 0.5, 2, and 4 h.

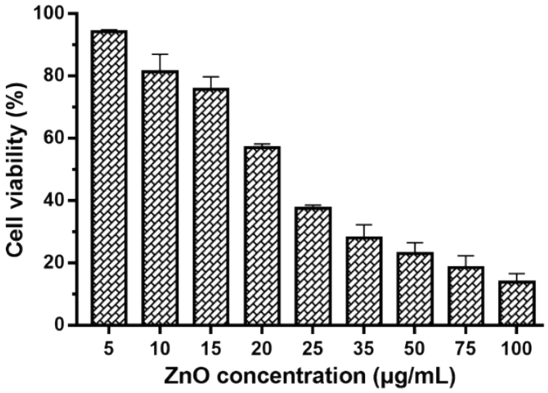

Fig. S6 Cell viability of A549 cells treated with ZnO QDs at different concentrations.

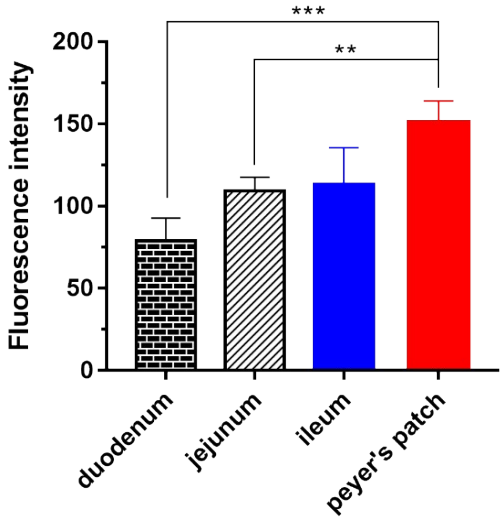

Fig. S7 Fluorescence intensity of duodenum, jejunum, ileum and Peyer's patch ($n = 6$, $^{**}p < 0.01$, $^{***}p < 0.001$).

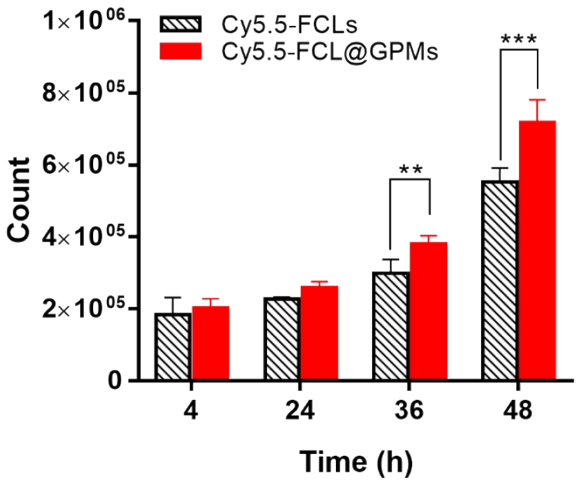

Fig. S8 Fluorescence intensity of different tumor samples ($n = 3$, $^{**}p < 0.01$, $^{***}p < 0.001$).