

Figure S1 Digital photographs of (A) LDH nanoparticles and (B) LDH nanosheets.

Abbreviations: LDH, layered double hydroxide.

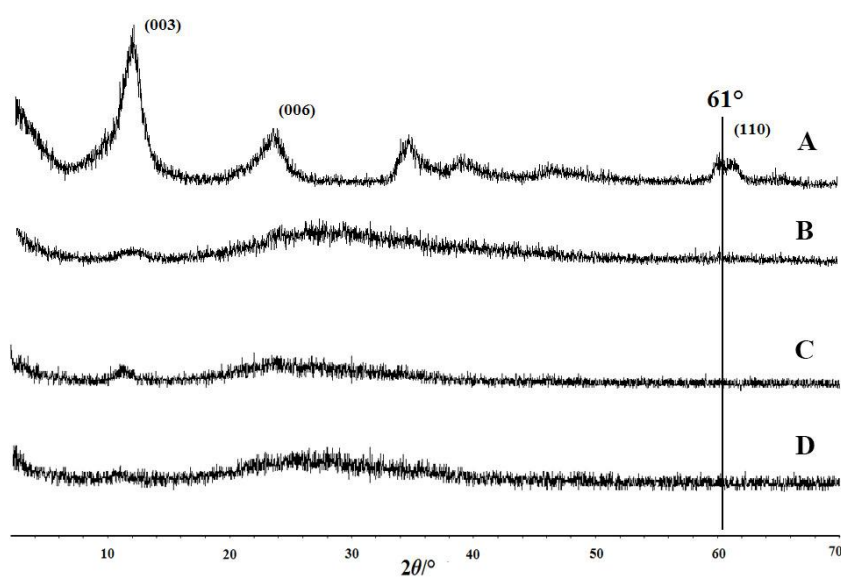


Figure S2 XRD patterns of (A) LDH nanoparticles, (B) LDH nanosheets, (C) CG-VV-LDH nanosheets and (D) CG-VV-PRN-LDH nanosheets.

Abbreviations: XRD, X-ray diffraction; LDH, layered double hydroxide; CG-VV, chitosan-glutathione-valine-valine; PRN, pirenexine sodium.

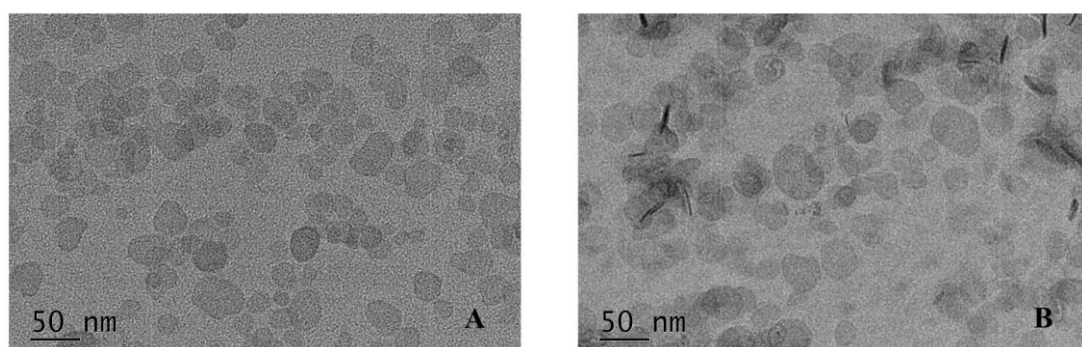


Figure S3 TEM micrograph of (A) LDH nanosheets and (B) CG-VV-LDH nanosheets.

Abbreviations: TEM, transmission electron microscope; LDH, layered double hydroxide; CG-VV, chitosan-glutathione-valine-valine.

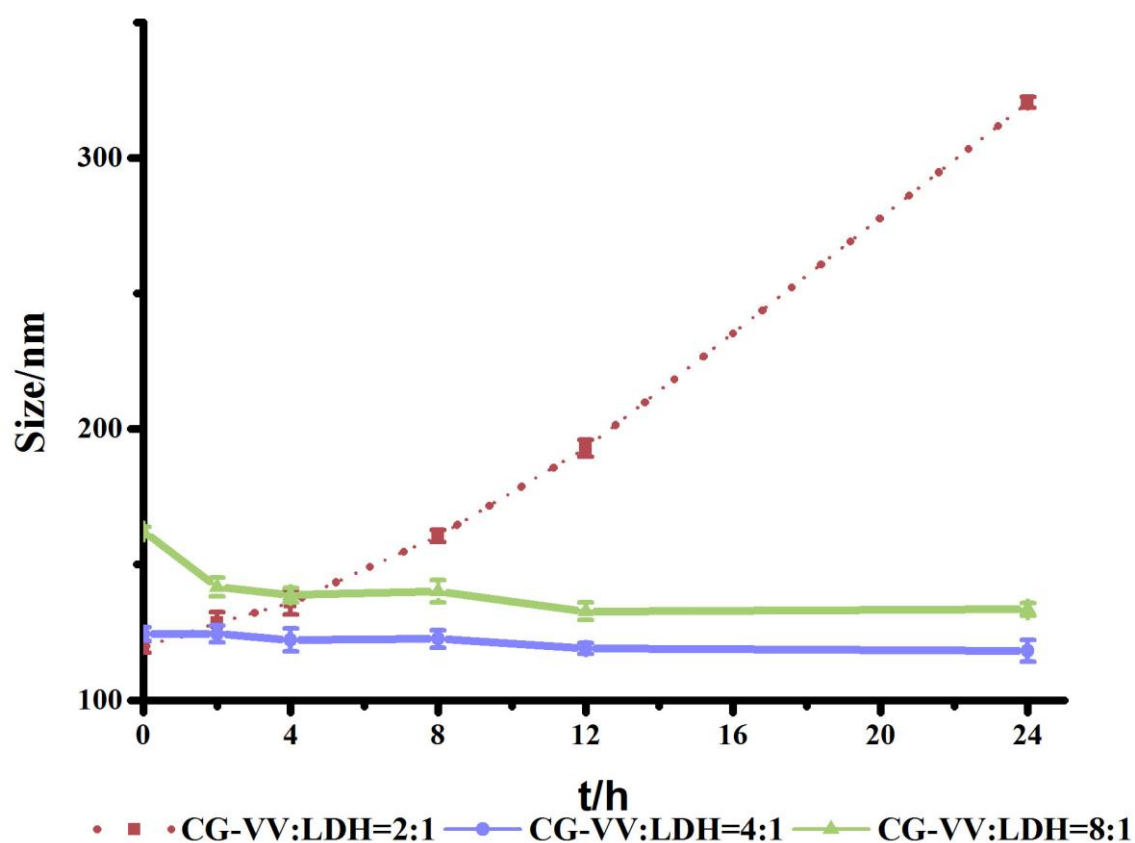


Figure S4 Size changes of CG-VV-PRN-LDH nanosheets in 10 mM PBS (pH 7.4)

Notes: Each value represents the mean \pm standard deviation (n=3).

Abbreviations: CG-VV, chitosan-glutathione-valine-valine; LDH, layered double hydroxide; PRN, pirenexine sodium; PBS: phosphate buffered saline.

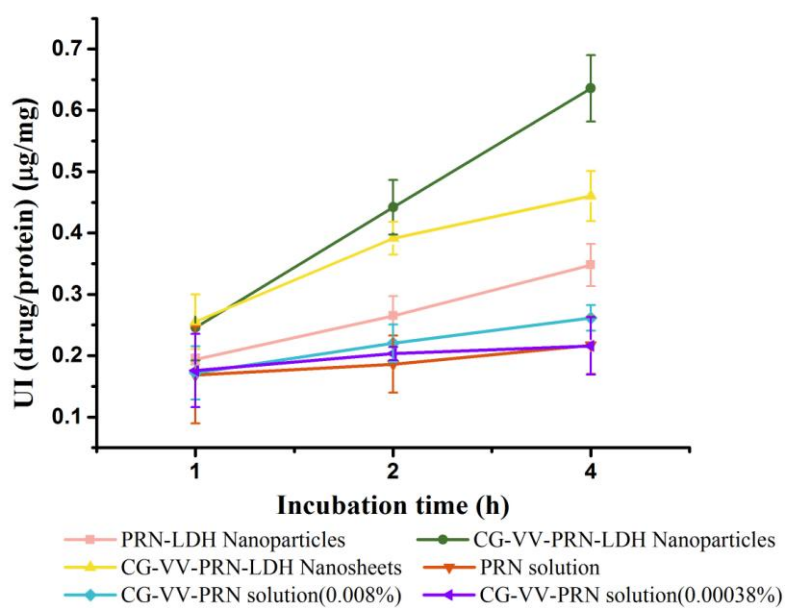


Figure S5 *In vitro* cellular uptake of CG-VV-PRN-LDH nanoparticles, CG-VV-PRN-LDH nanosheets, PRN-LDH nanoparticles, CG-VV-PRN (0.008%, 0.00038% (w/v)) and free PRN at different time points.

Notes: Each value represents the mean \pm standard deviation (n=3).

Abbreviations: LDH, layered double hydroxide; PRN, pirenoxine sodium; CG-VV, chitosan-glutathione-valine-valine.

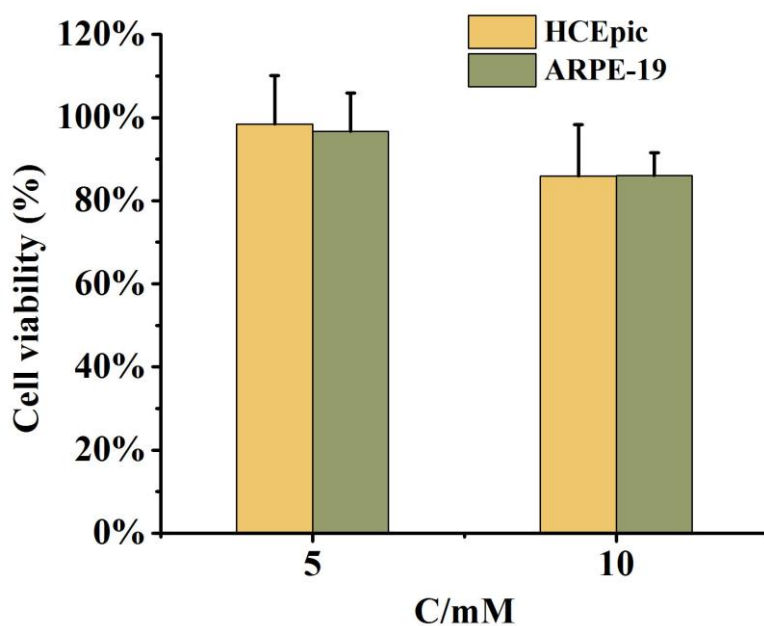


Figure S6 *In vitro* cytotoxicity of Gly-Sar against HCEpic cells and ARPE-19 cells after 12 h incubation; cell viability was determined by MTT assay, respectively.

Notes: Each value represents the mean \pm standard deviation (n=4).

Abbreviations: Gly-Sar, glycine-sarcosine; HCEpic, human corneal epithelial primary cells; MTT, 3-(4,5-dimethyl-2-thiazolyl)-2,5-diphenyl-2-H-tetrazolium bromide; ARPE-19, retinal pigment epithelial cells.

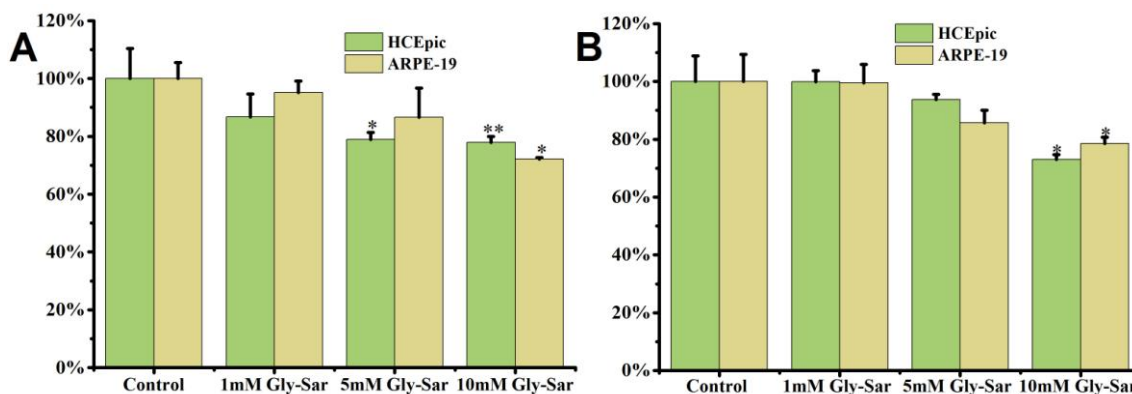


Figure S7 Flow cytometry measurement of intracellular uptake of (A) CG-VV-FITC-LDH nanoparticles and (B) CG-VV-TITC-LDH nanosheets treated with Gly-Sar (1 mM, 5 mM, 10 mM) on HCEpic cells and ARPE-19 cells, respectively.

Notes: HCEpic cells or ARPE-19 cells without treatment with Gly-Sar were taken as the control (* P <0.05, ** P <0.01 vs control group, n = 3).

Abbreviations: Gly-Sar, glycine-sarcosine; HCEpic, human corneal epithelial primary cells; ARPE-19, retinal pigment epithelial cells; FITC, fluorescein isothiocyanate; LDH, layered double hydroxide; CG-VV, chitosan-glutathione-valine-valine.