Supporting Information

Construction of blood compatible lysine-immobilized chitin/carbon nanotubes microspheres and potential applications for blood purified therapy

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20 Contents

21 1. Photographs of CNTs and Ch/CNT solution (Fig. S1).............................S4

22 2. XPS spectra of CNTs (Fig. S2)..................................................................S5

23 3. Profile height parameters of CNTs (Fig. S3)..............................................S6

24 4. Photographs of Ch/Lys and Ch/CNT/Lys microspheres (Fig. S4).............S7

25 5. Characterization of chitin-based microspheres and CNTs. (Fig. S5).......S8

26 6. Zeta-potential of chitin-based microspheres and CNTs. (Fig. S6).........S9

27 7. In vitro cytotoxicity tests of CNTs (Fig. S7).............................................S10

28 8. Optical microscopy, fluorescence microscopy and SEM images of L-02 cells cultured on chitin microspheres (Fig. S8)..........................S11

29 9. Activated partial thromboplastin time (APTT) of blood treated with microspheres and pristine CNTs (Fig. S9)..............................S12

30 10. Changes in the blood content (WBC, RBC, HGB and PLT) after treatment with chitin-based microspheres. (Fig. S10) ..................S13

31 11. Changes in the blood content (NEUT, LYMPH, MONO and EO) after treatment with chitin-based microspheres. (Fig. S11) ........S14

32 12. Changes in the blood content (HCT, MCV, MCHC and MPV) after treatment
39 with chitin-based microspheres. (Fig. S12)

40 ..................................................S15

41 13.

42 14. Chemical Structure of bilirubin (Fig. S13).................................S16

43 15. Langmuir isotherm of bilirubin adsorption capacity of chitin-based microspheres

44 and pristine CNTs (Fig. S14)...............................................................S17

45 16. The relative parameters of Langmuir model (Table S1) ...............S18

46 17. The removal rate of bilirubin and protein from plasma on the chitin-based

47 microspheres and pristine CNTs (Fig. S15).................................S19

48
Fig. S1 (a1) Photograph of the pristine CNTs precipitated in water, (a2) SEM image of pristine CNTs, (a3) optical microscopy image of the pristine CNTs agglomerated in water, (b1) photograph of modified CNTs aqueous suspension (0.125mg/ml), (b2) SEM image of modified CNTs, (b3) optical microscopy image of homogenous modified CNTs aqueous solution, (c1) photograph of Ch/CNT homogeneous solution, (c2) optical microscopy image of Ch/CNT microspheres and (c3) optical microscopy image of Ch/CNT homogeneous solution.
Fig. S2 XPS spectra of C1s (a) and O1s (b) for pristine CNTs and modified CNTs, respectively.
Fig. S3 Line profiles along the lines marked in the AFM images of modified CNTs (a) and Ch/CNT (b)
Fig. S4 (a1) Photograph of Ch/Lys microspheres, (a2, a3) SEM images of Ch/Lys microspheres, (a4) size distribution of Ch/Lys microspheres, (b1) photograph of Ch/CNT/Lys microspheres, (b2, b3) SEM images of Ch/CNT/Lys microspheres and (b4) size distribution of Ch/CNT/Lys microspheres.
Fig. S5 (a) Raman spectroscopy of Ch/Lys and Ch/CNT/Lys microspheres, (b) FT-IR spectra, (c) pore size distribution determined by the DFT method and (d) TG curves of chitin-based microspheres and CNTs.
Fig. S6 Zeta-potential of chitin-based microspheres and CNTs.
Fig. S7 (a) In vitro cytotoxicity tests of different concentration of pristine CNTs incubated with HUVEC cells, (b) different concentration of modified CNTs incubated with HUVEC cells, (c) different concentration of pristine CNTs incubated with L-02 cells and (d) different concentration of modified CNTs incubated with L-02 cells. Data are expressed as mean ± SD (n=4).
Fig. S8 Optical microscopy, fluorescence microscopy and SEM images of L-02 cells cultured on chitin microspheres (a), Ch/CNT microspheres (b), Ch/CNT/Lys microspheres (c) and pristine CNTs (d). The nuclei of the HUVEC cells were stained with 4’, 6-diamidino-2-phenylindole (DAPI).
Fig. S9 Activated partial thromboplastin time (APTT) of blood treated with microspheres and pristine CNTs. Data are expressed as mean ± SD (n=4).
Fig. S10 Changes in the blood content after treatment with chitin-based microspheres. (a) White blood cell (WBC), (b) Red blood cell (RBC), (c) Hemoglobin (HGB) and (d) Platelet (PLT).
Fig. S11 Changes in the blood content after treatment with chitin-based microspheres. (a) Neutrophils (NEUT), (b) Lymphocyte (LYMPH), (c) Monocyte (MONO) and (d) Eosinophilia (EO).
Fig. S12 Changes in the blood content after treatment with chitin-based microspheres. (a) Hematokrit (HCT), (b) Mean corpuscular volume (MCV), (c) Mean corpuscular hemoglobin concentration (MCHC) and (d) Mean platelet volume (MPV).
Fig. S13 Chemical Structure of bilirubin. ($\text{C}_{33}\text{H}_{36}\text{N}_{4}\text{O}_{6}$, molar mass 584.66g/mol.).
Fig. S14 Langmuir isotherm of bilirubin adsorption capacity of chitin-based microspheres and pristine CNTs in aqueous solution (PH=7.4).
<table>
<thead>
<tr>
<th>Samples</th>
<th>Experiment</th>
<th>Langmuir</th>
<th>Standard</th>
<th>R²</th>
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<td>Q max(mg/g)</td>
<td>Q max-Langmuir</td>
<td>(mg/g)</td>
<td>Error</td>
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<td>pristine CNTs</td>
<td>123.6</td>
<td>134.5</td>
<td>4.8</td>
<td>0.95</td>
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</table>
Fig. S15 Removal rate of total bilirubin (TBIL) (a), direct bilirubin (DBIL) (b) and total protein (TP) from plasma on the chitin-based microspheres and pristine CNTs. ($C_{0\, \text{TBIL}} = 55.1 \, \mu\text{mol/L}; \, C_{0\, \text{DBIL}} = 42.2 \, \mu\text{mol/L}; \, C_{0\, \text{TP}} = 20.1 \, \text{g/L}$). Data are expressed as mean ± SD (n=4). The bars represent SD. *p < 0.05, **p < 0.001, when compared with chitin microspheres. *p < 0.05 was considered statistically significant.