

# **Enantioselective effect of Cysteine functionalized Mesoporous Silica Nanoparticles in U87 MG and GM08680 human cells and Staphylococcus aureus bacteria**

## Supporting Information

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## 1) Nanoparticles Characterization

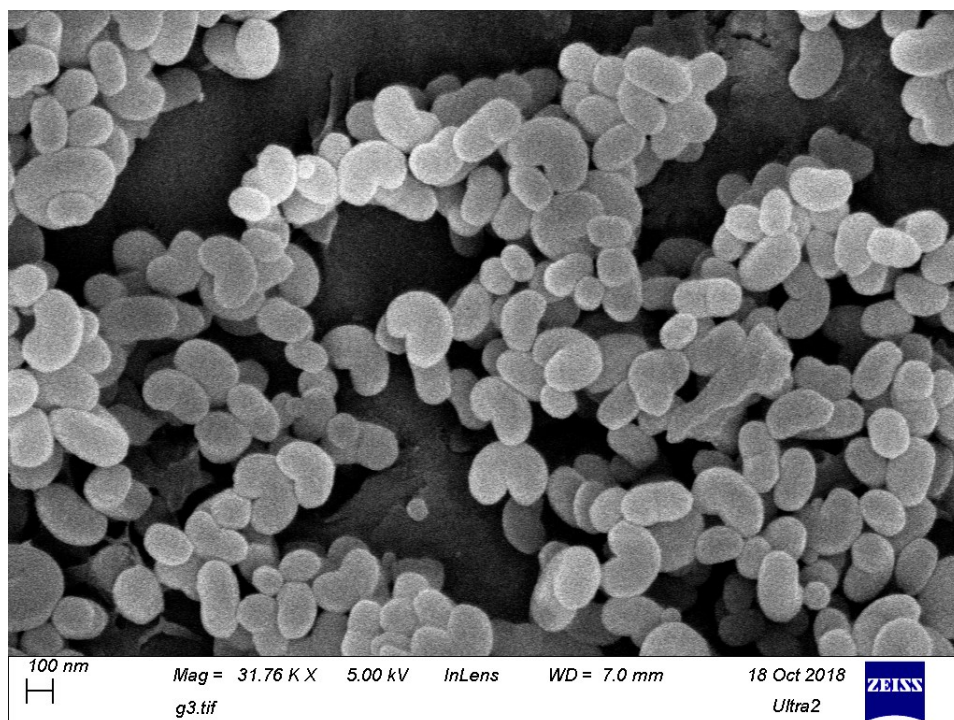


Figure S1. SEM image of COOH-MSN

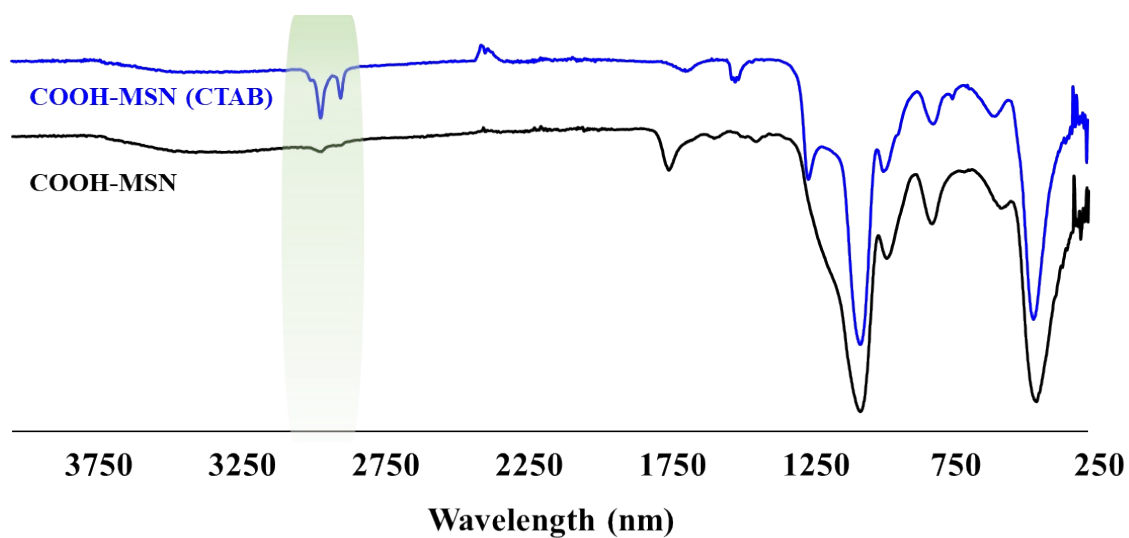


Figure S2. FTIR spectra of COOH- MSN before and after CTAB extraction.

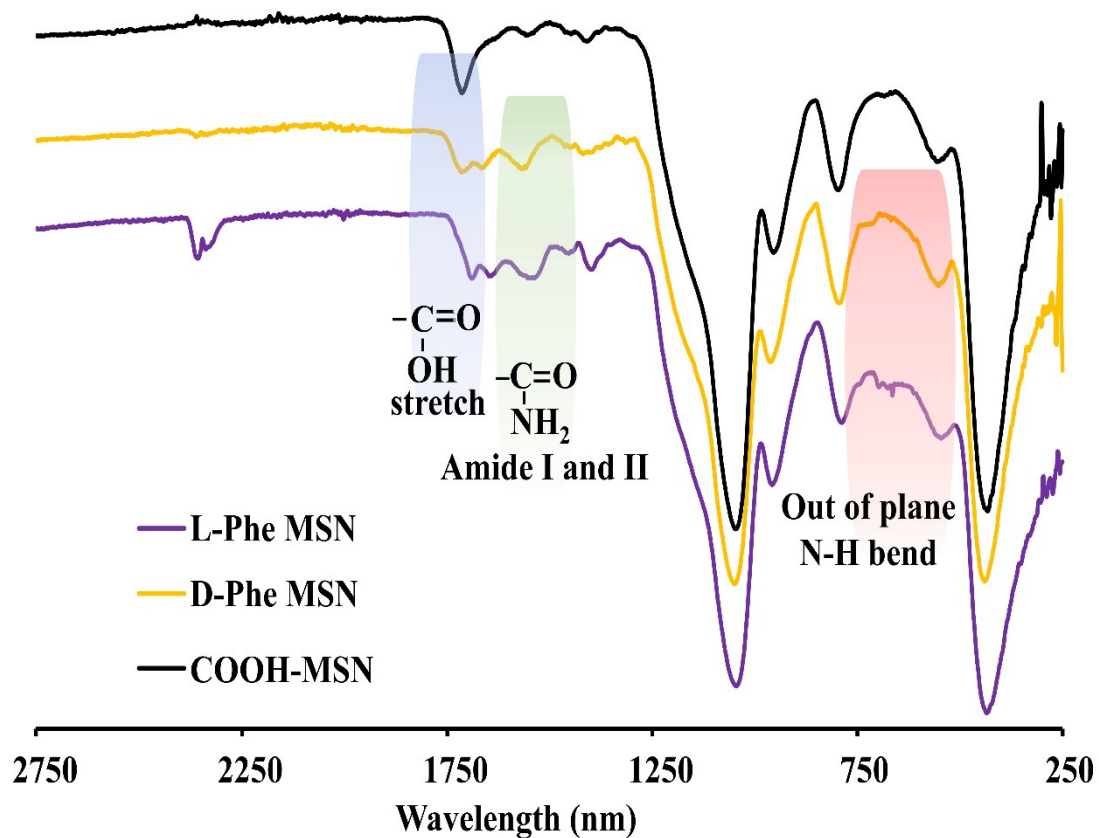


Figure S3. FTIR spectra of COOH- MSN, D-Phen MSN and L-Phen MSN.

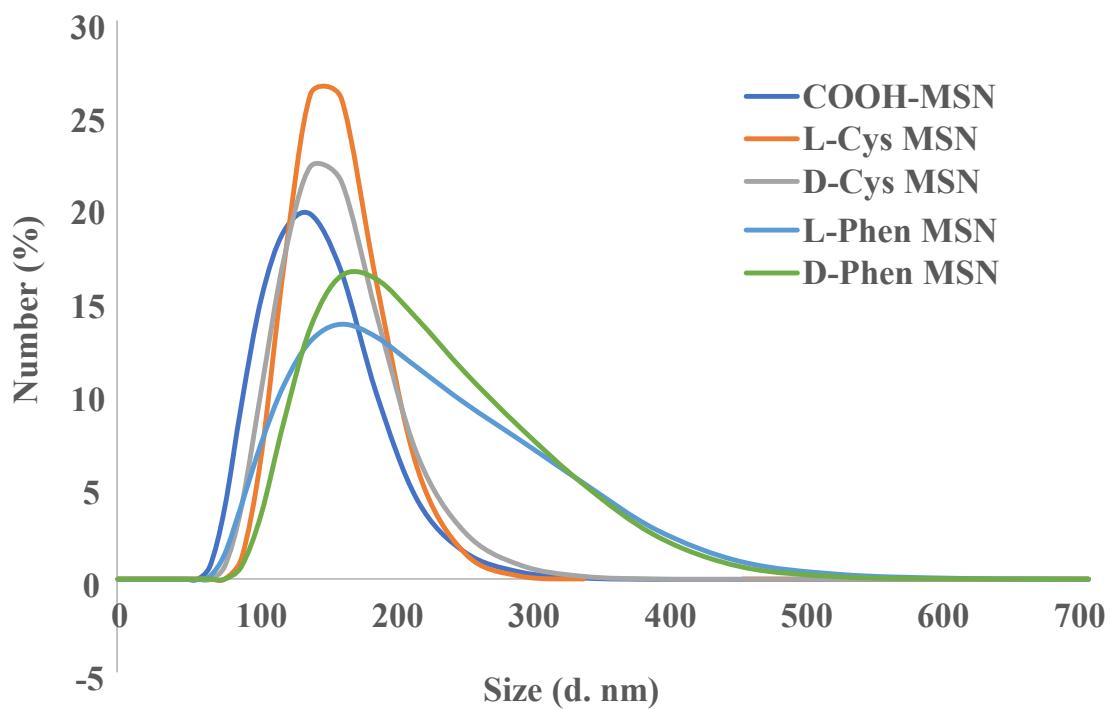
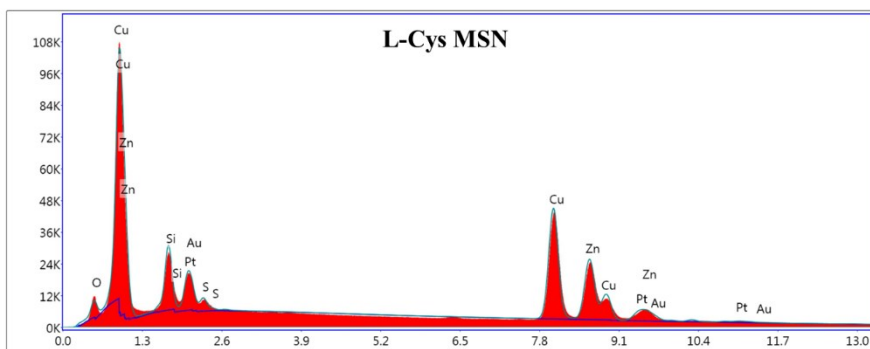
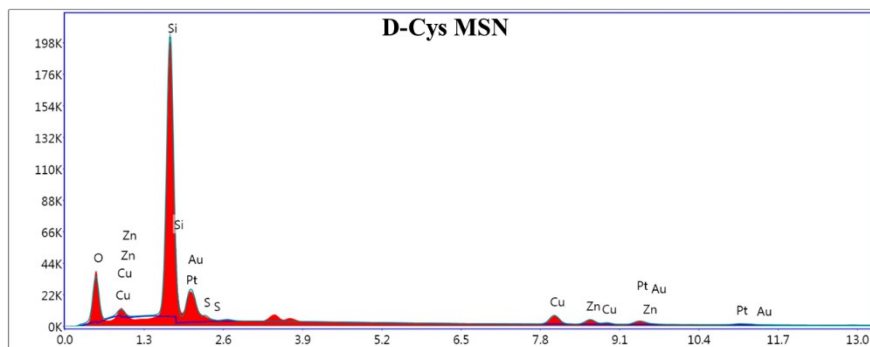


Figure S4. Hydrodynamic size of COOH-MSN, D/L-Cys MSN and D/L-Phen MSN, measured by DLS.



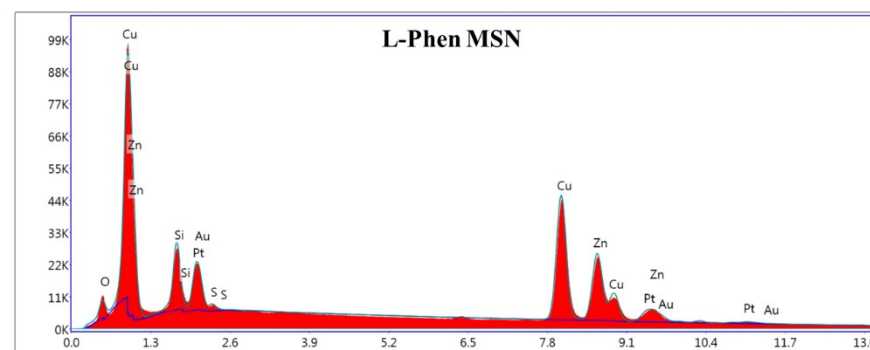
Lsec: 30.0 0 Cnts 0.000 keV Det: Octane Plus Det

| Element | Weight % |
|---------|----------|
| O K     | 3.24     |
| SiK     | 5.51     |
| S K     | 0.92     |
| CuK     | 40.78    |
| ZnK     | 28.16    |
| PtL     | 13.76    |
| AuL     | 7.61     |



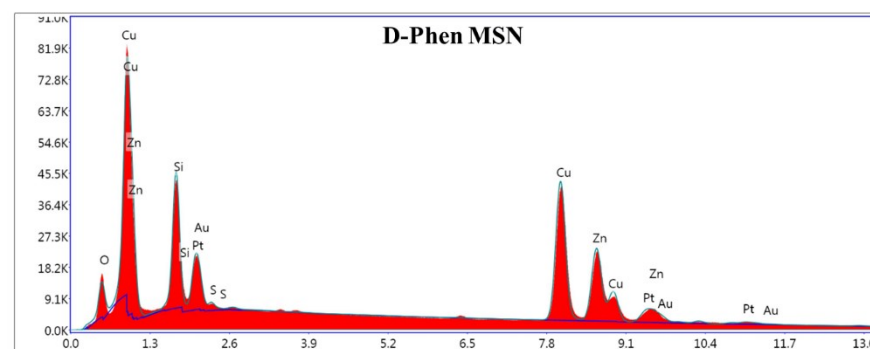
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| Element | Weight % |
|---------|----------|
| O K     | 25.69    |
| SiK     | 40.97    |
| S K     | 0.94     |
| CuK     | 9.06     |
| ZnK     | 6.03     |
| PtL     | 14.85    |
| AuL     | 2.46     |



Lsec: 30.0 0 Cnts 0.000 keV Det: Octane Plus Det

| Element | Weight % |
|---------|----------|
| O K     | 5.35     |
| SiK     | 8.68     |
| S K     | 0.30     |
| CuK     | 39.21    |
| ZnK     | 25.94    |
| PtL     | 13.05    |
| AuL     | 7.46     |



Lsec: 30.0 0 Cnts 0.000 keV Det: Octane Plus Det

| Element | Weight % |
|---------|----------|
| O K     | 3.05     |
| SiK     | 5.31     |
| S K     | 0.32     |
| CuK     | 41.68    |
| ZnK     | 28.38    |
| PtL     | 13.96    |
| AuL     | 7.30     |

Figure S5. TEM-EDX analysis of D-Cys MSN, L-Cys MSN, D-Phen MSN, and L-Phen MSN.

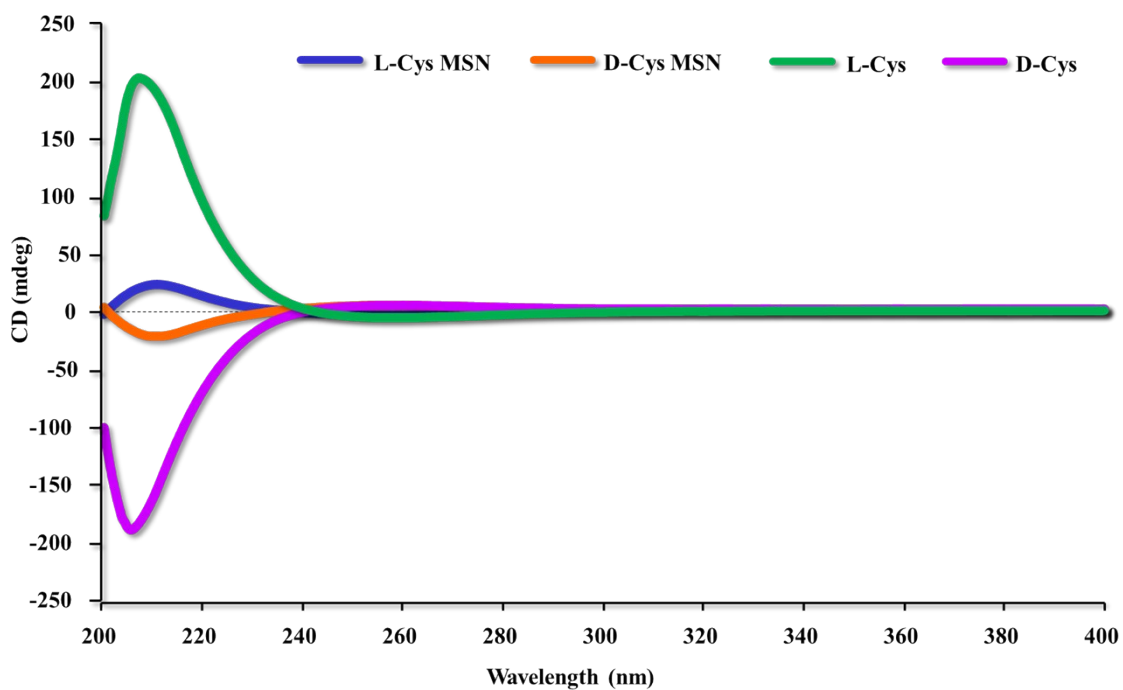


Figure S6. CD spectra of D-Cys, L-Cys, D-Cys MSN and L-Cys MSN.

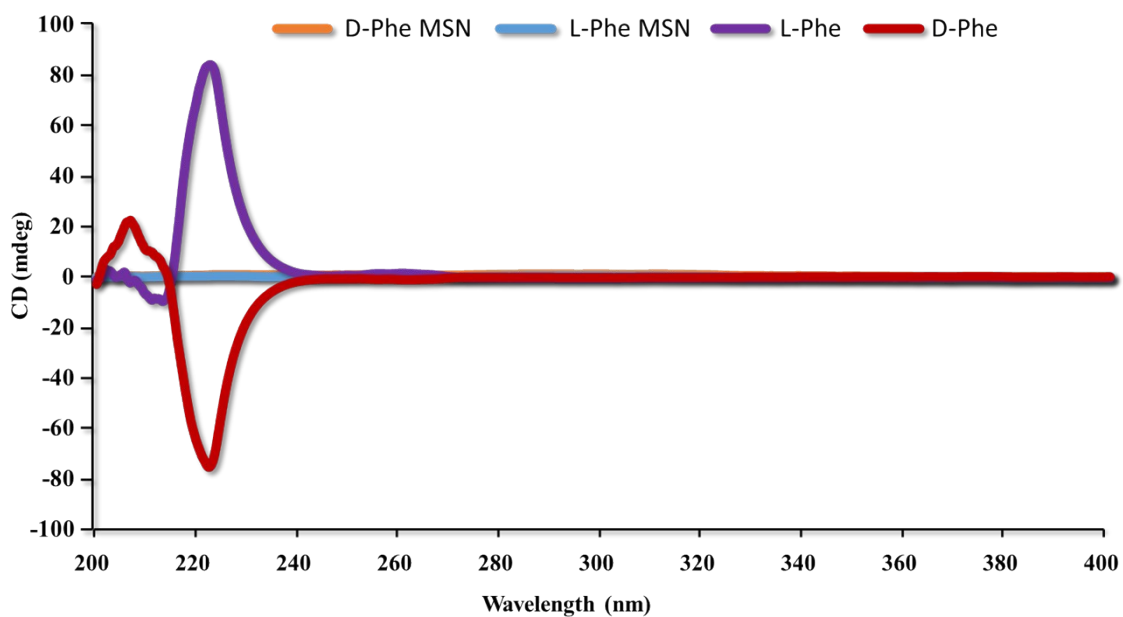


Figure S7. CD spectra of D-Phen, L- Phen, D- Phen MSN and L- Phen MSN.

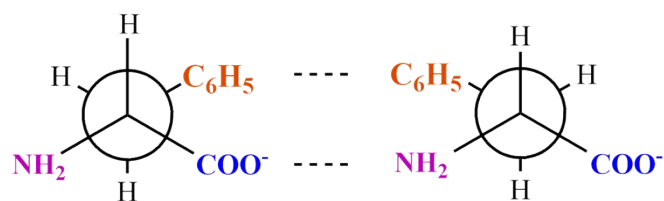


Figure S8. Newman projections of left and right binding conformations of Phen molecules on the MSN surface, corresponding to the opposite stereoisomers.

## 2) Internalization and toxicity of plain MSN in U87 MG cells

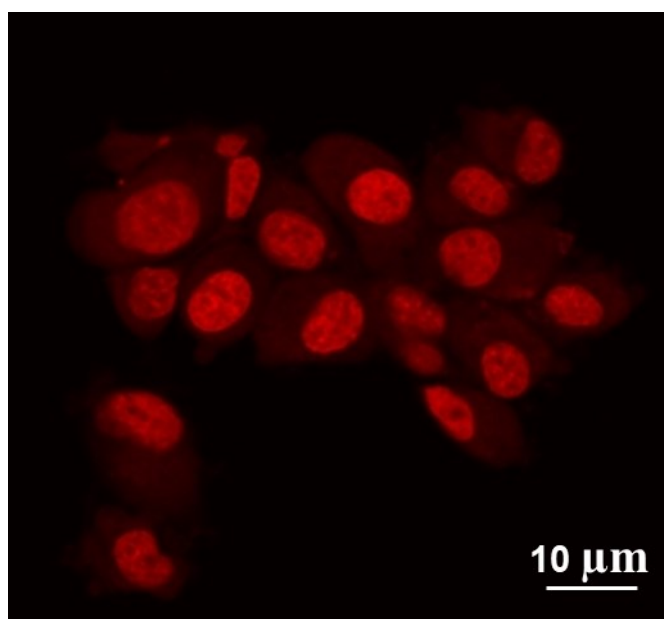


Figure S9. Internalization study by confocal microscopy of 50 μg/mL of green-labelled nanoparticles after 2 h of incubation.

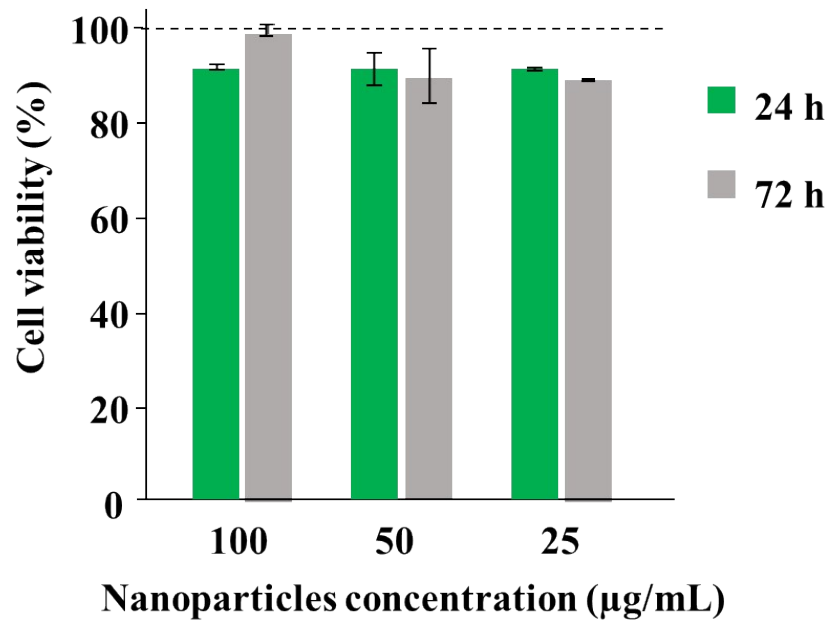


Figure S10. U87 glioblastoma cells viability after 2 h treatment with different concentrations of MSN.

### 3) Flow cytometry Data of D-Cys MSN and L-Cys MSN in U87 MG cells

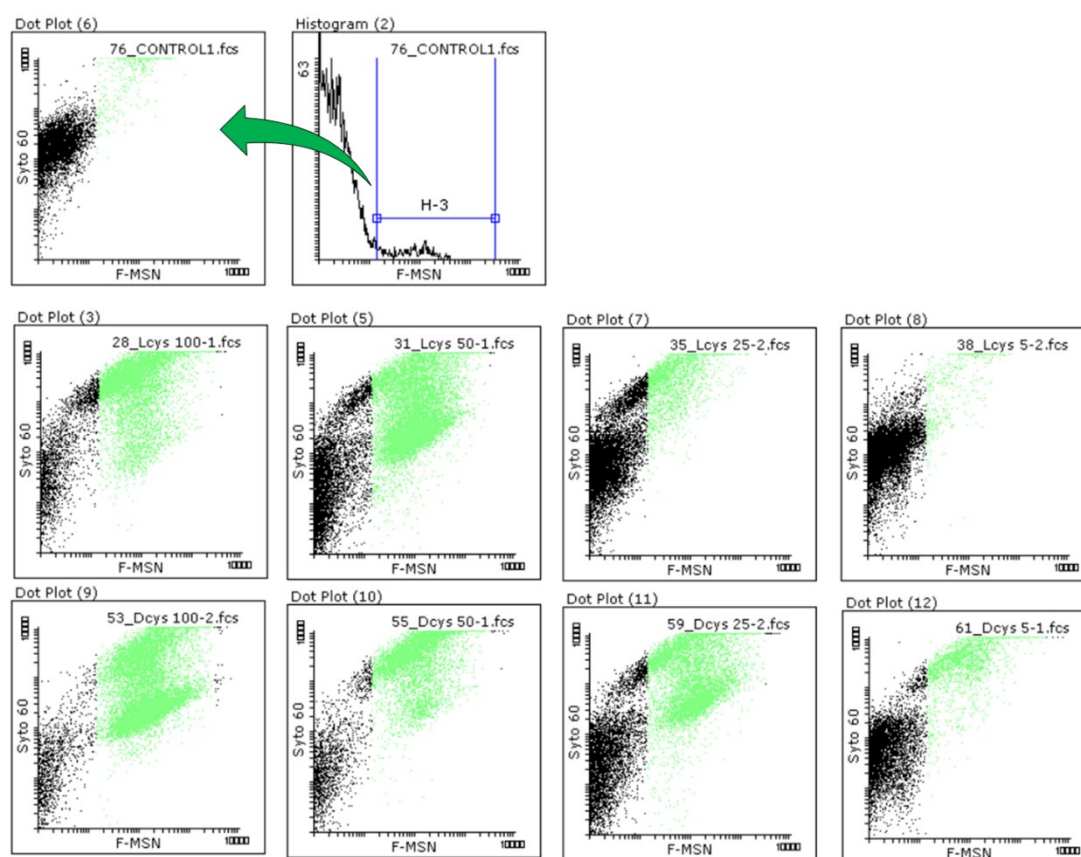


Figure S11. Flow cytometry of the internalization of fluorescent L-/D-Cys-MSN in U87 MG at different incubation concentrations (5, 25, 50 and 100 µg/mL)



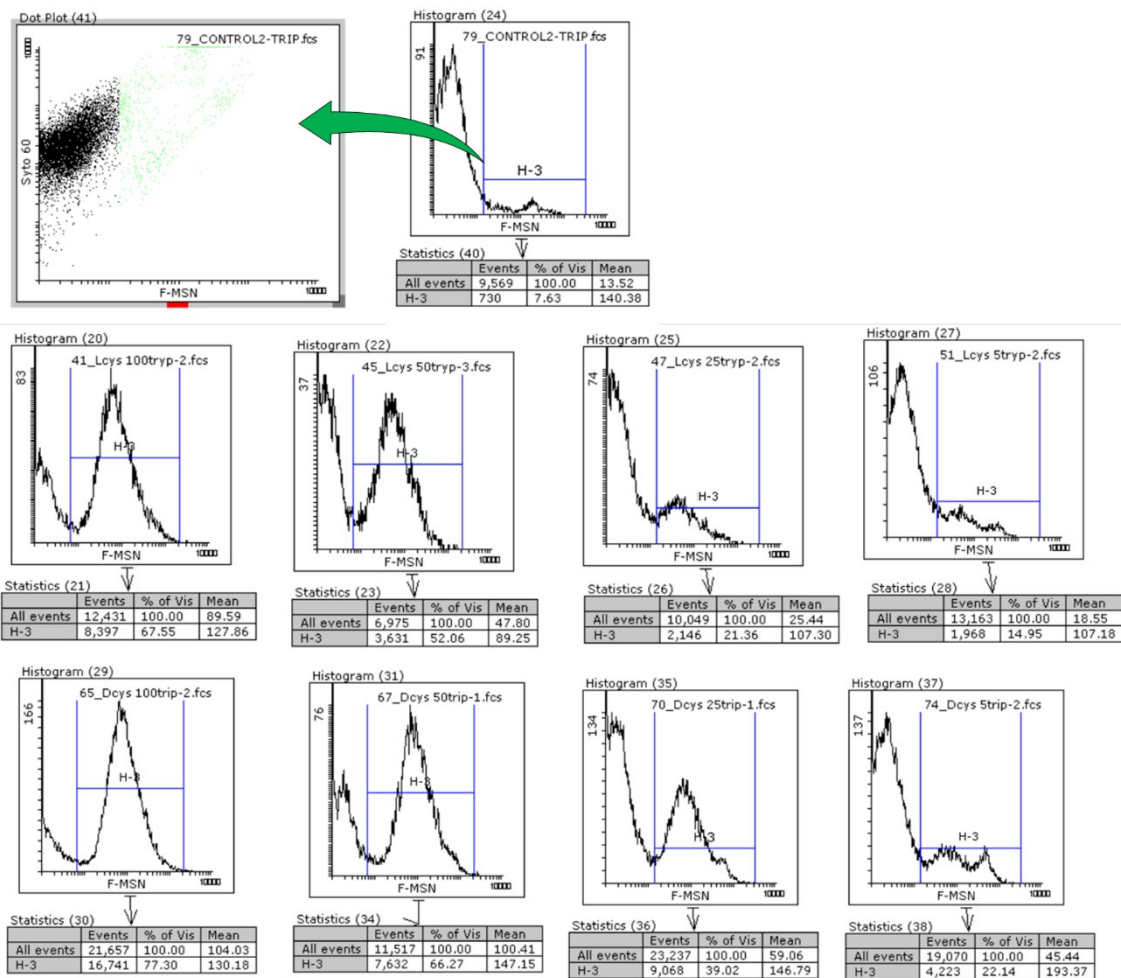
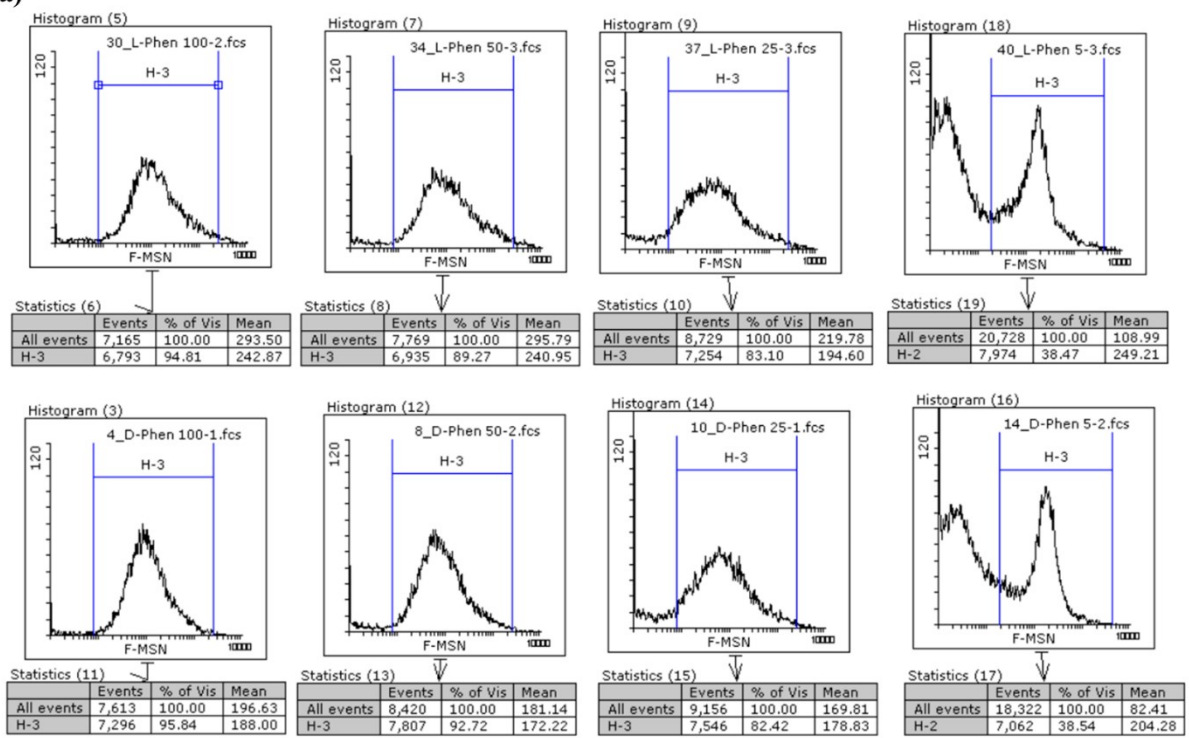


Figure S12. Flow cytometry of trypan blue treated U87 MG cells incubated in the presence to a certain amount (5, 25, 50 and 100  $\mu\text{g/mL}$ ) of fluorescent L-/D-Cys MSN.

#### 4) Flow cytometry Data of D-Phen MSN and L-Phen MSN in U87 MG cells

a)



b)

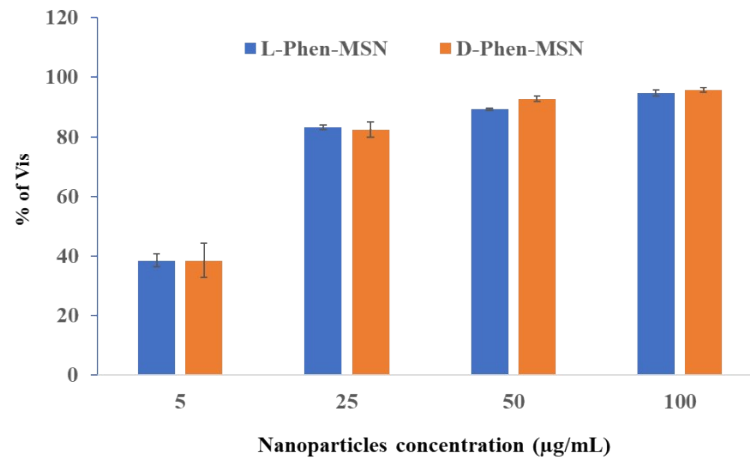


Figure S13. a) Histogram of the internalization of fluorescent L-/D-Phen-MSN in U87 MG at different incubation concentrations (5, 25, 50 and 100 µg/mL) of. b) Evolution of internalization as a function of concentration.

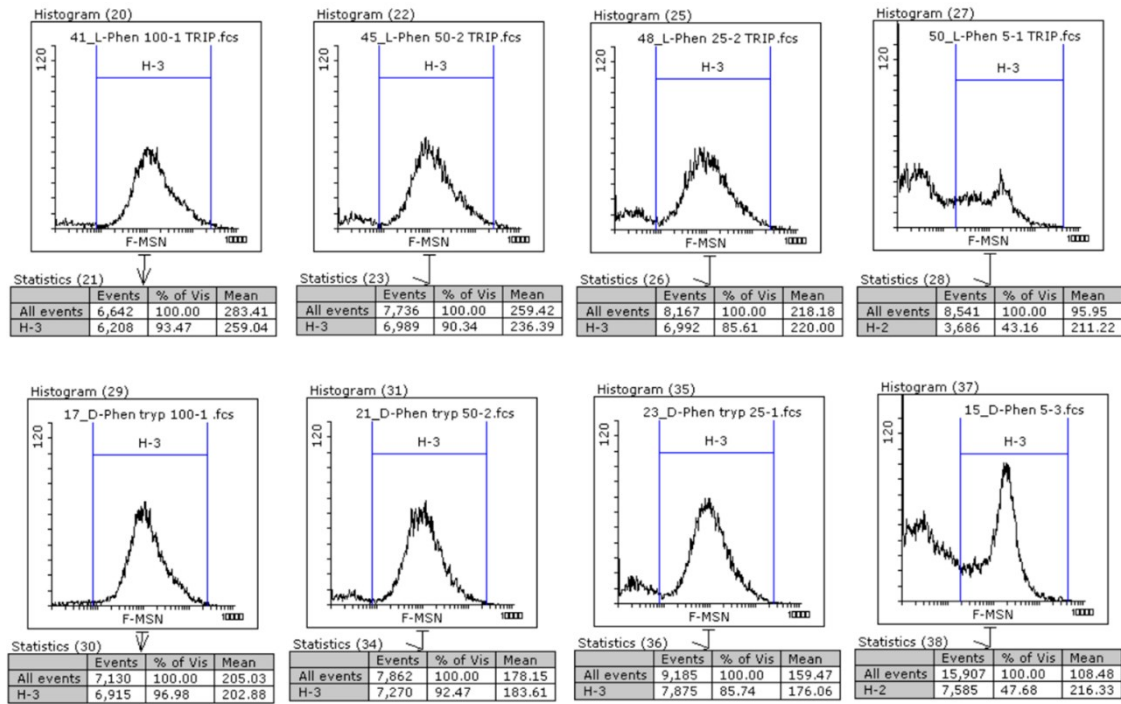


Figure S14. Flow cytometry of trypan blue treated U87 MG cells incubated in the presence to a certain amount (5, 25, 50 and 100 µg/mL) of fluorescent L-/D-Phen MSN.

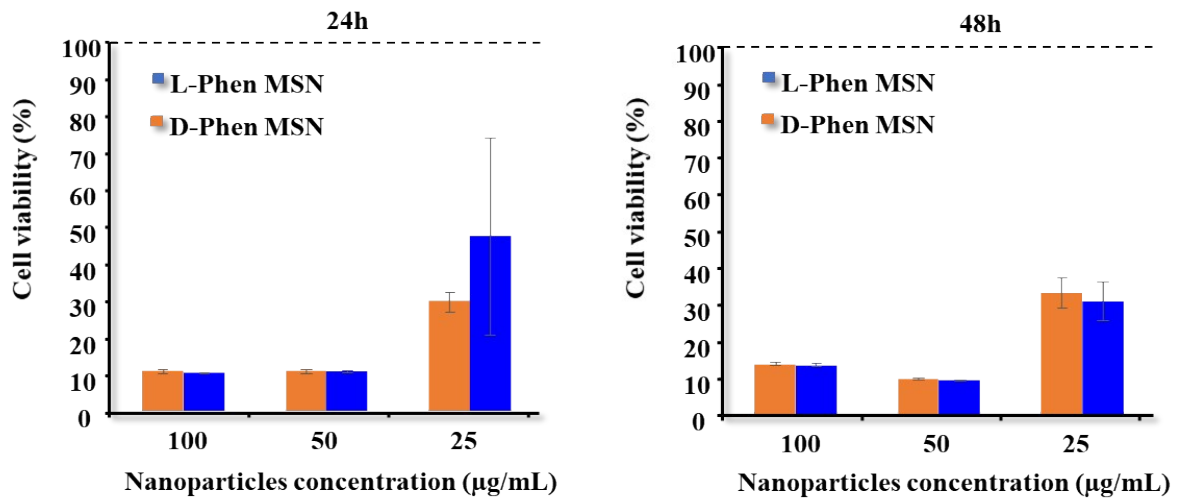


Figure S15. Cytotoxicity assay measured by Cell Counting Kit-8 (CCK-8) in U87 MG cells with different concentrations (25, 50 and 100 µg/mL) of chiral Phen MSN at 24 and 48 h of cell culture. Data are mean ± SEM, experiments were performed in triplicate.

5) Flow cytometry Data of D-Cys MSN and L-Cys MSN in healthy human fibroblast (GM08680)

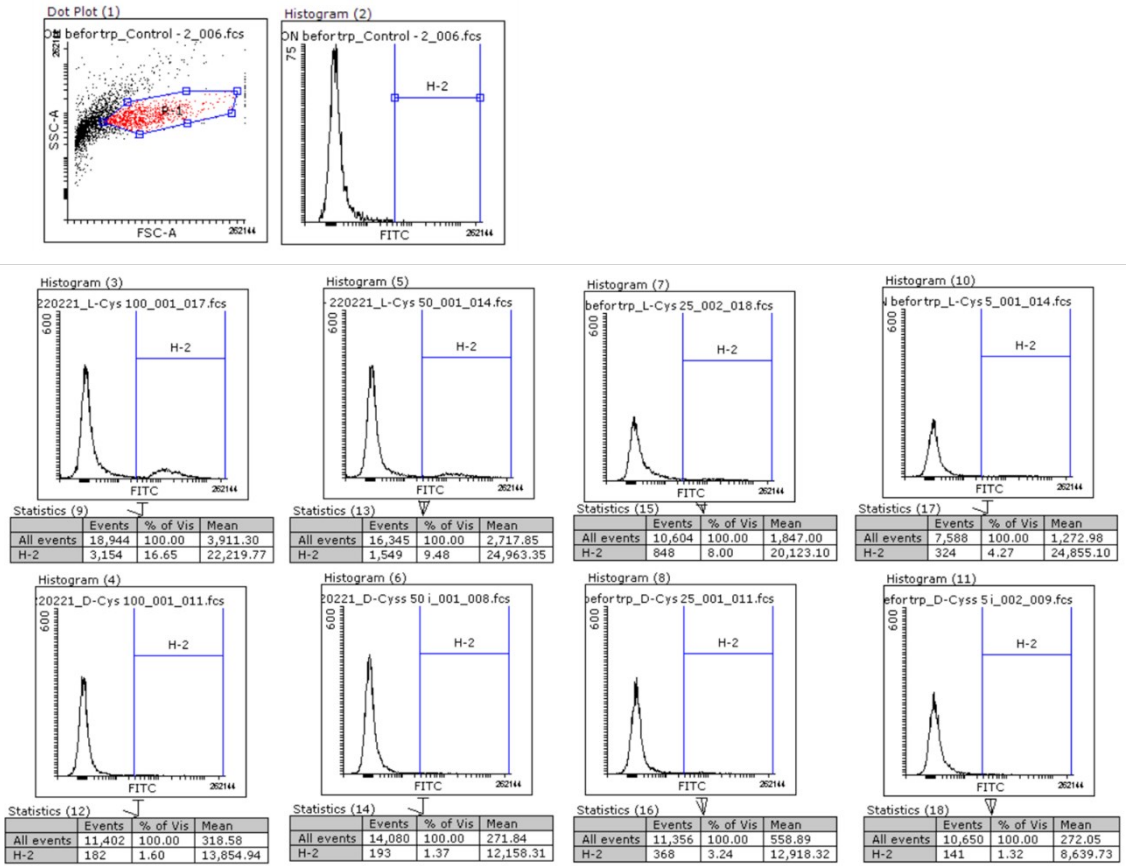


Figure S16. Flow cytometry of the internalization of fluorescent L-/D-Cys-MSN in healthy human fibroblast (GM08680) at different incubation concentrations (5, 25, 50 and 100 µg/mL)

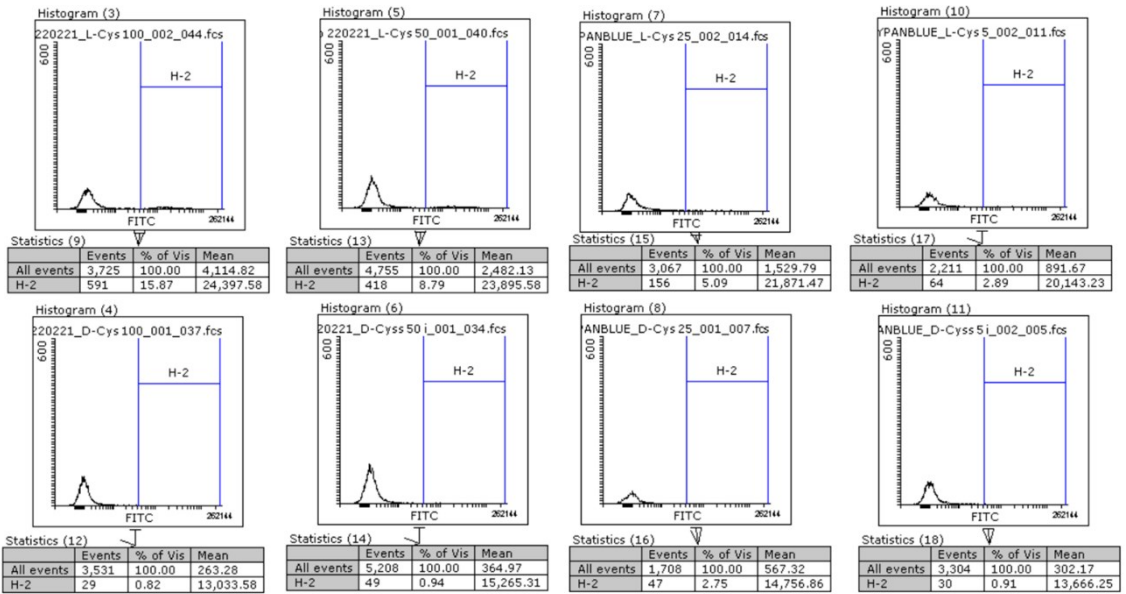


Figure S17. Flow cytometry of trypan blue treated GM08680 cells incubated in the presence to a certain amount (5, 25, 50 and 100 µg/mL) of fluorescent L-/D-Cys MSN.

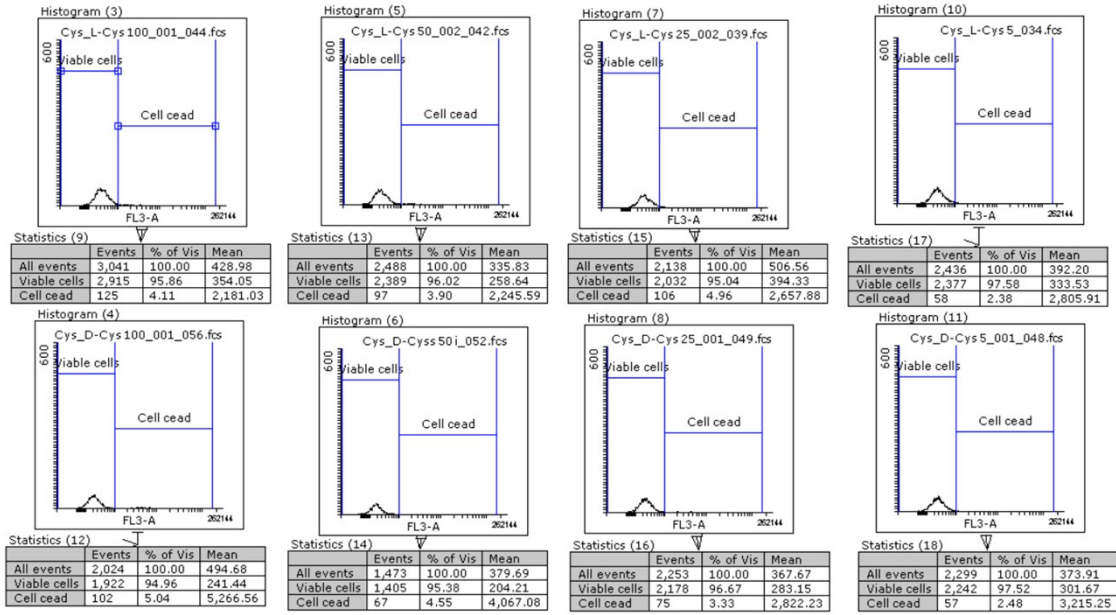


Figure S18. Flow cytometry measurements of the cytotoxicity of a certain amount (5, 25, 50 and 100 µg/mL) of L-/D-Cys MSN in GM08680 cells after 24 h of treatment.

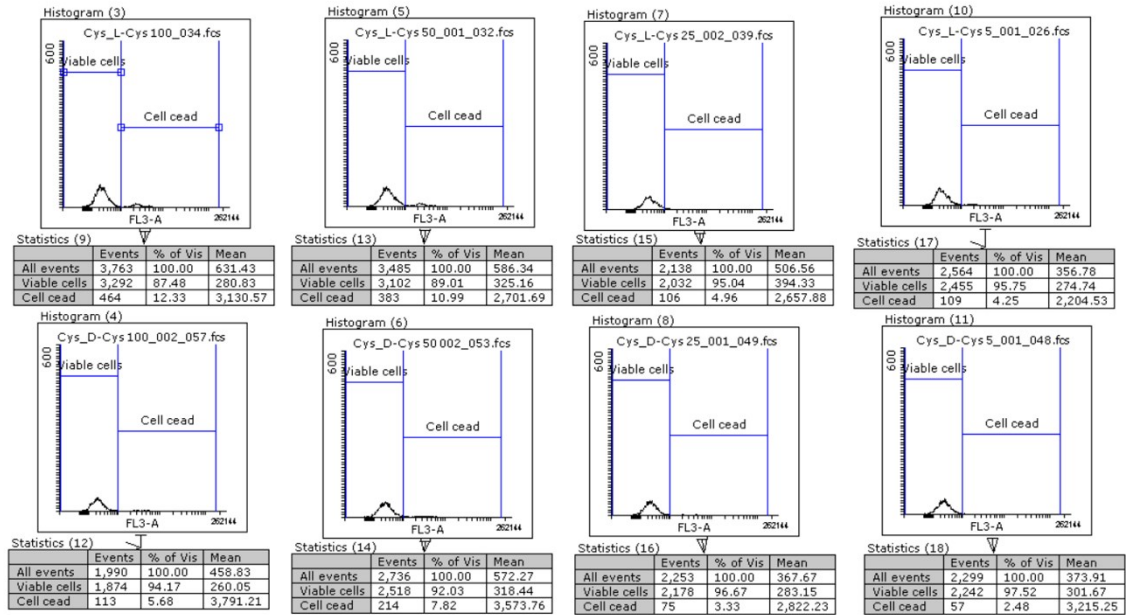


Figure S19. Flow cytometry measurements of the cytotoxicity of a certain amount (5, 25, 50 and 100 µg/mL) of L-/D-Cys MSN in GM08680 cells after 48 h of treatment.



## 6) Flow cytometry Data of D-Phen MSN and L-Phen MSN in healthy human fibroblast (GM08680)

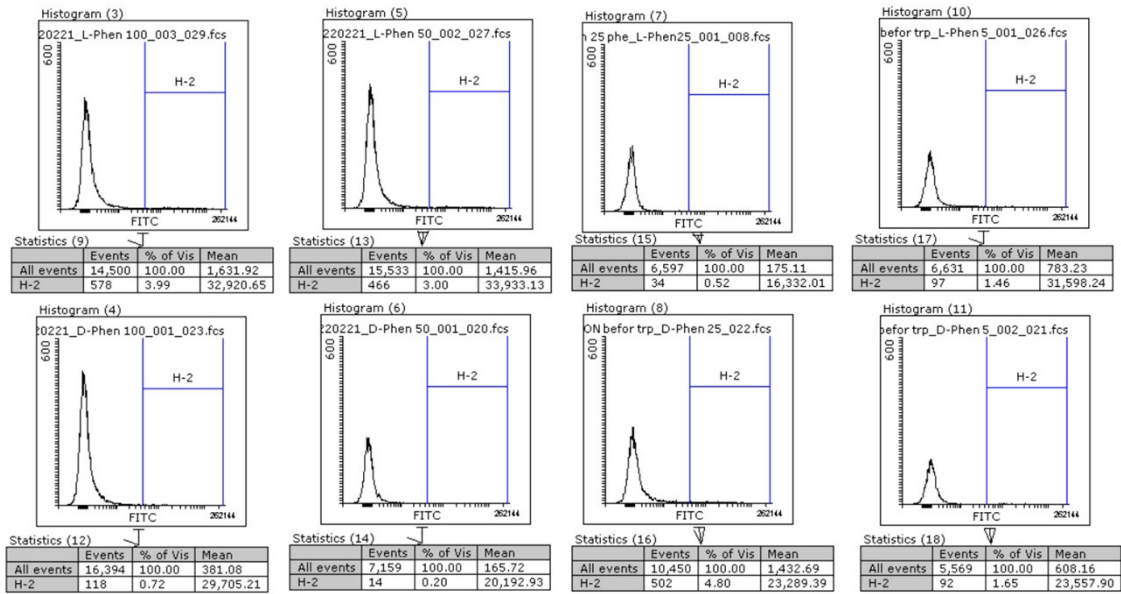


Figure S20. Flow cytometry of the internalization of fluorescent L-/D-Phen MSN in healthy human fibroblast (GM08680) at different incubation concentrations (5, 25, 50 and 100 µg/mL)

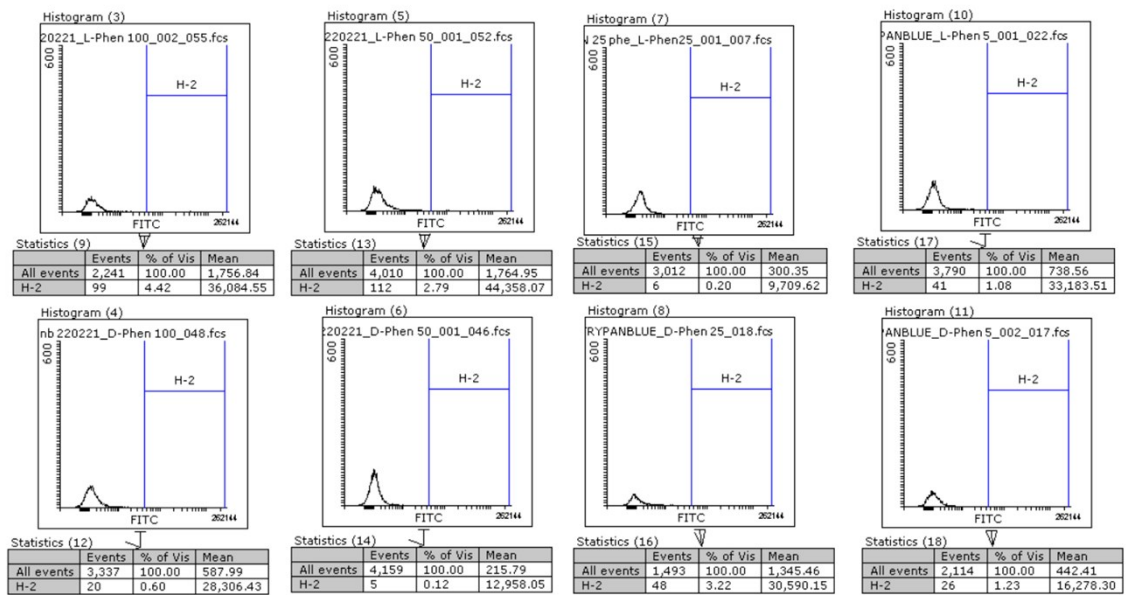


Figure S21. Flow cytometry of trypan blue treated GM08680 cells incubated in the presence to a certain amount (5, 25, 50 and 100 µg/mL) of fluorescent L-/D-Phen MSN.

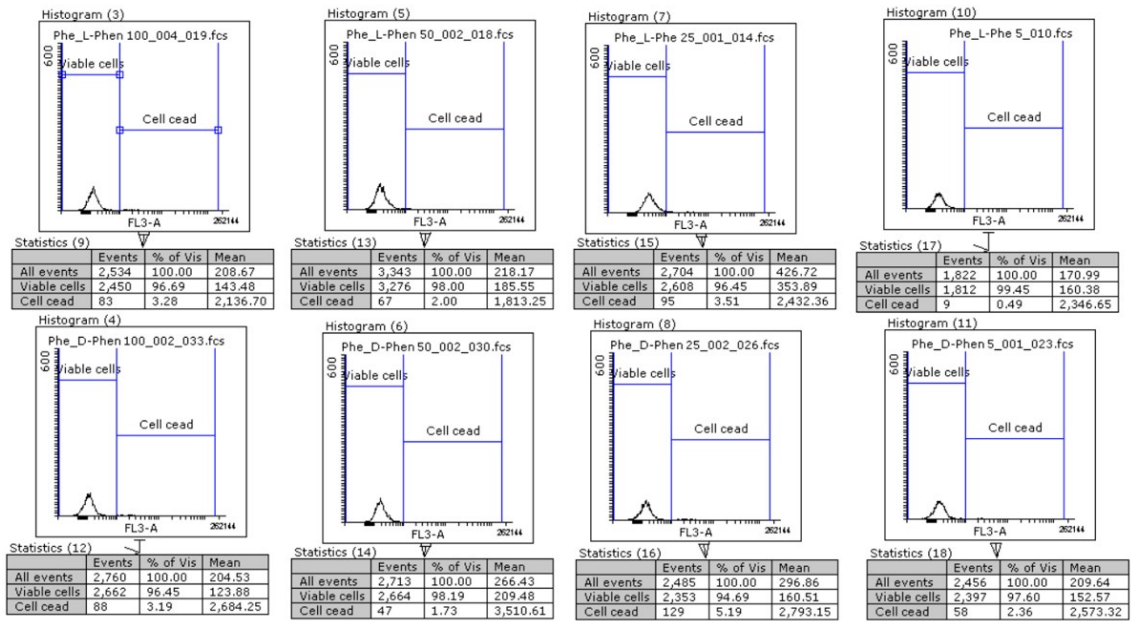


Figure S22. Flow cytometry measurements of the cytotoxicity of a certain amount (5, 25, 50 and 100  $\mu\text{g/mL}$ ) of L-/D-Phen MSN in GM08680 cells after 24 h of treatment.

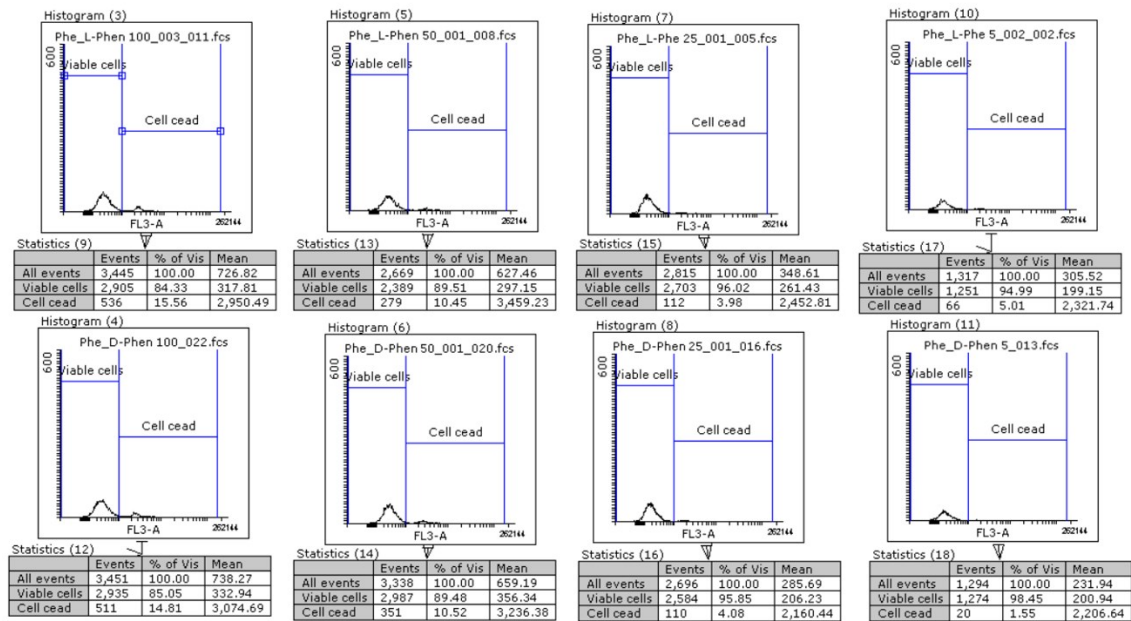


Figure S23. Flow cytometry measurements of the cytotoxicity of a certain amount (5, 25, 50 and 100  $\mu\text{g/mL}$ ) of L-/D-Phen MSN in GM08680 cells after 48 h of treatment.

## 7) Flow cytometry Data of D/L-Cys MSN and D/L-Phen MSN in *S. aureus* bacteria

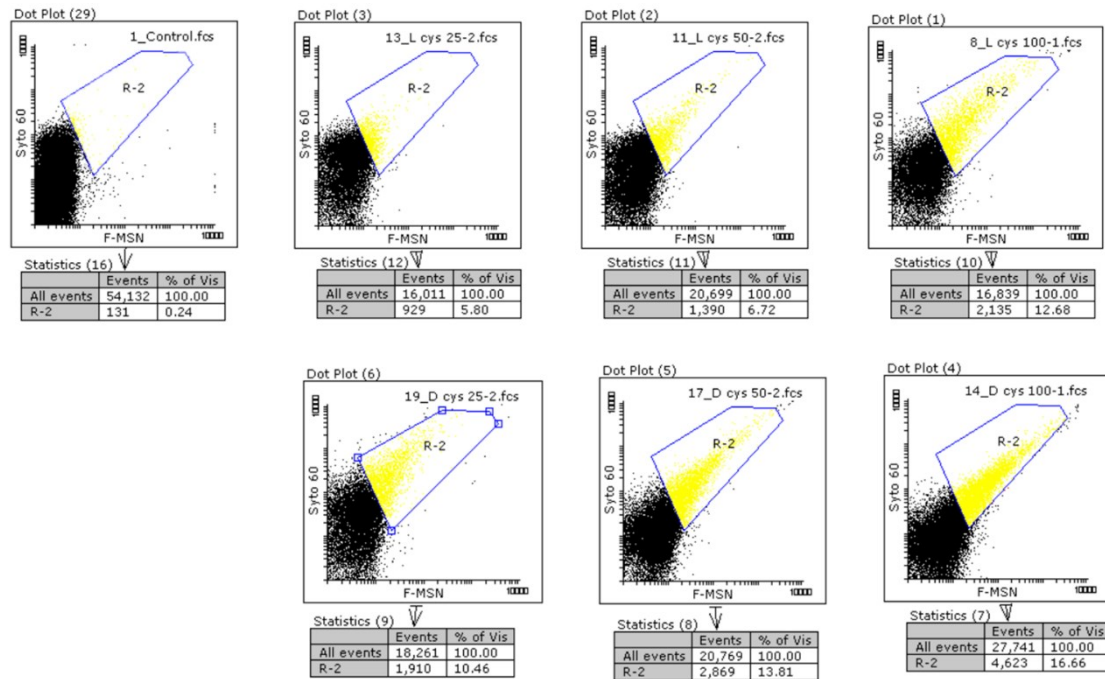


Figure S24. Flow cytometry of *S. aureus* bacteria incubated in the presence to a certain amount (25, 50 and 100  $\mu\text{g}/\text{mL}$ ) of fluorescent L-/D-Cys MSN.



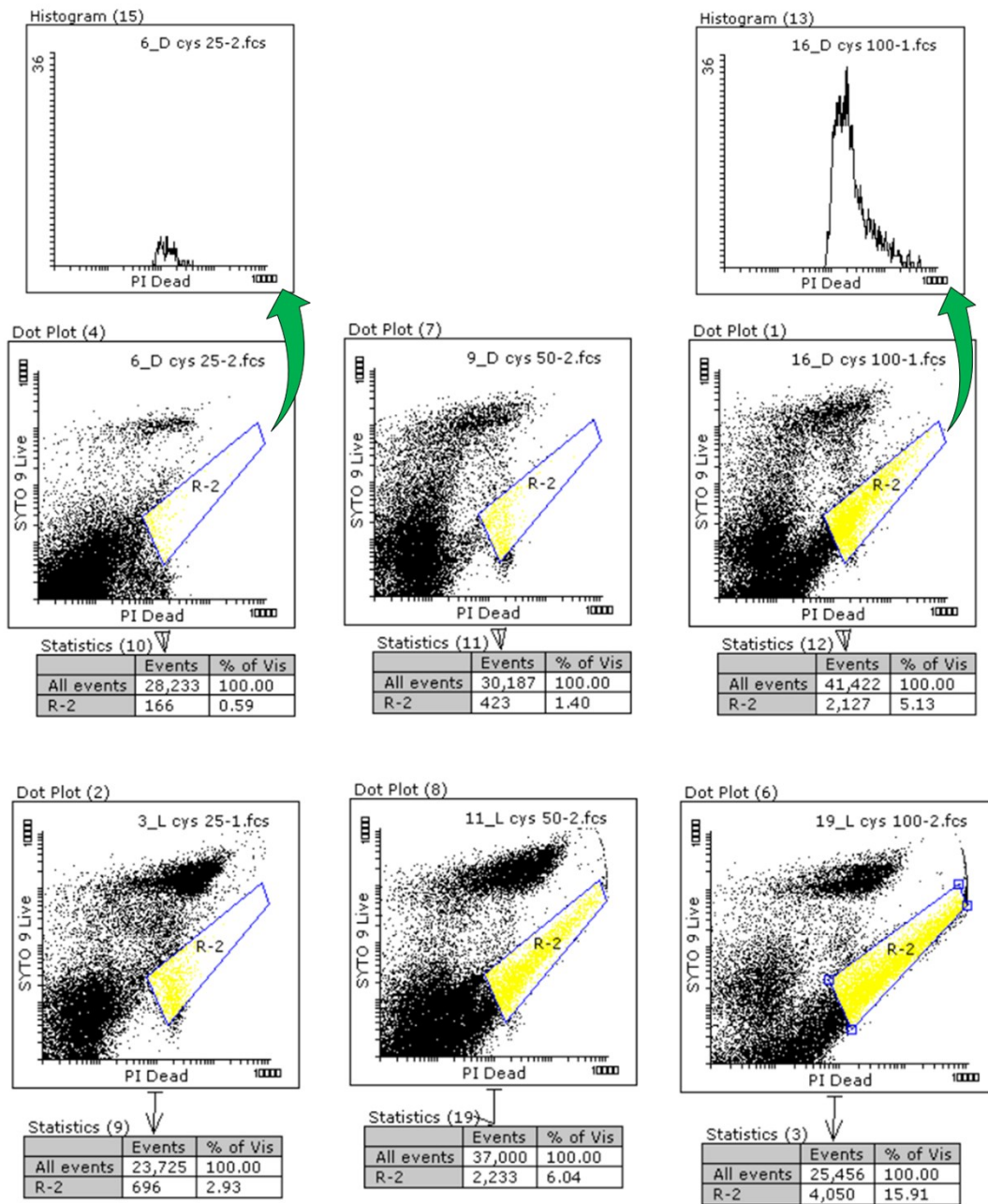


Figure S25. Flow cytometry of *S. aureus* bacteria incubated in the presence to a certain amount (25, 50 and 100  $\mu\text{g}/\text{mL}$ ) of L-/D-Cys MSN and treated with (LIVE/DEAD™ BacLight™ Bacterial Viability Kit).

## 8) Flow cytometry Data of D-Phen MSN and L-Phen MSN in *S. aureus* bacteria

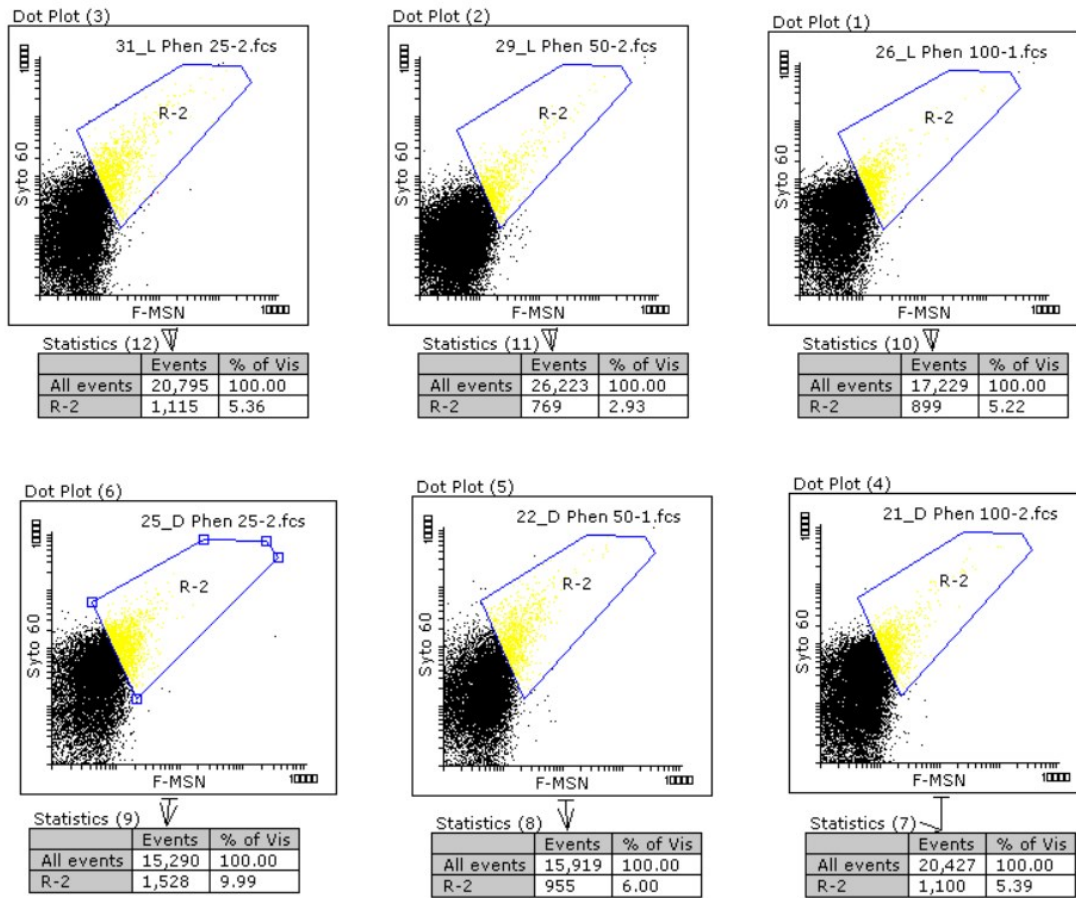


Figure S26. Flow cytometry of *S. aureus* bacteria incubated in the presence to a certain amount (25, 50 and 100 µg/mL) of fluorescent L-/D-Phen MSN.

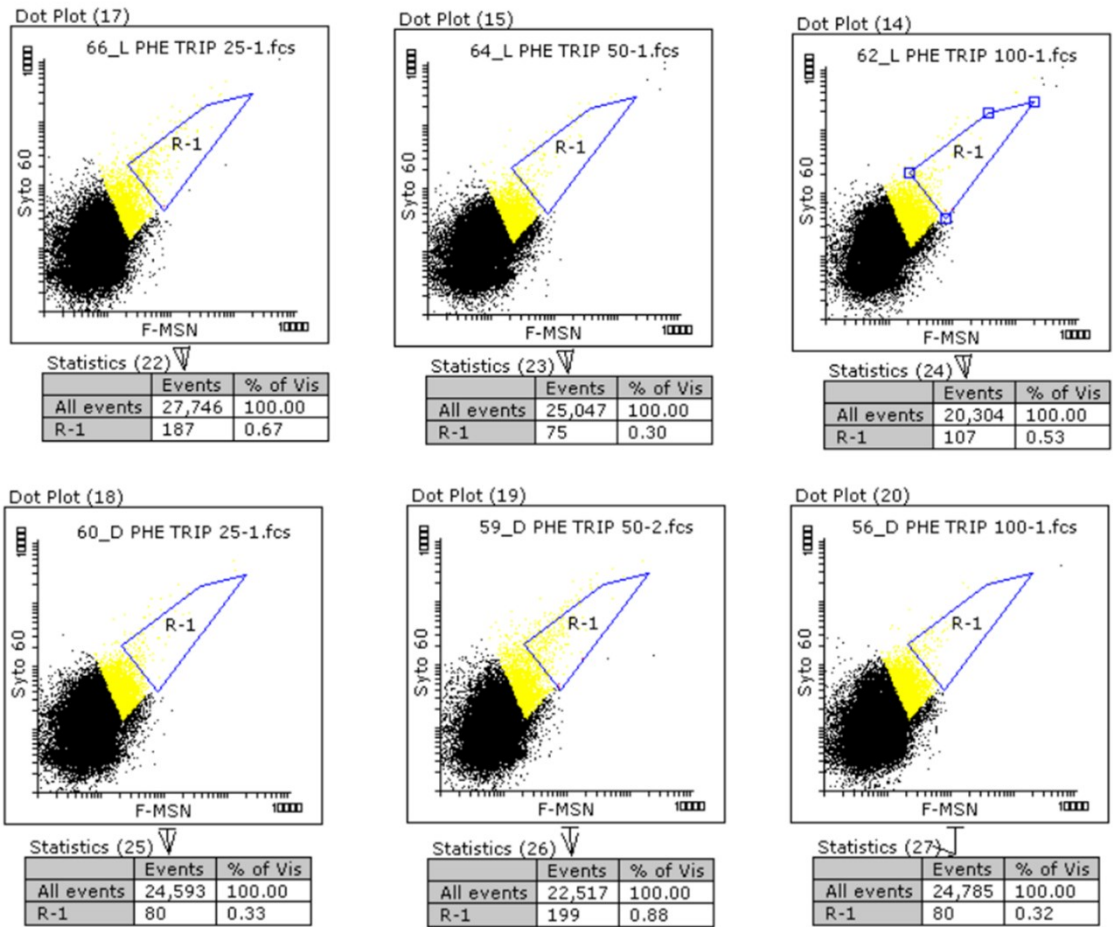


Figure S27. Flow cytometry of trypan blue treated *S. aureus* bacteria incubated in the presence to a certain amount (25, 50 and 100 µg/mL) of fluorescent L-/D-Phen MSN. The yellow fraction is considered F-MSN<sup>+</sup> in absence of trypan blue, R1 is the F-MNS<sup>+</sup> fraction in the presence of trypan blue.

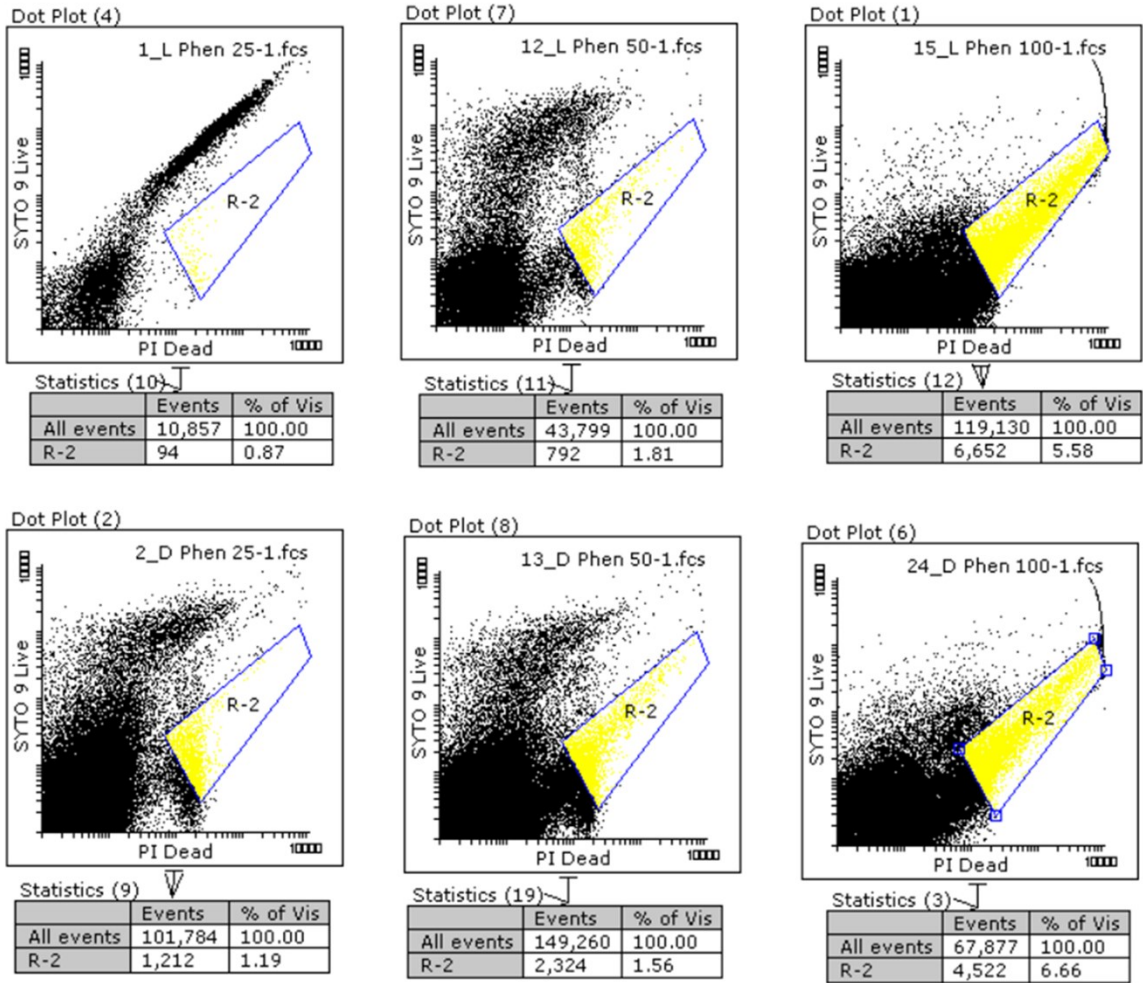


Figure S28. Flow cytometry of *S. aureus* bacteria incubated in the presence to a certain amount (25, 50 and 100 µg/mL) of L-/D-Cys MSN and treated with (LIVE/DEAD™ BacLight™ Bacterial Viability Kit).