Supporting information

The Control of Epidermal Growth Factor Grafted on Mesoporous Silica Nanoparticles for Targeted Delivery

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a. These authors have made equal contribution to this work.

Particle size distribution of HMSNs

Figure S1 DLS curve of HMSNs
Confocal images of FITC labelled HMSNs and HMSN-COOH-EGF

Figure S2 Confocal images of (a-c): FITC labelled HMSNs and (d-f): HMSN-COOH-EGF. a, d: FITC channel; b, e: bright field; c: merge of a and b; f: merge of d and e.

Score plots of EGF, HMSNs, HMSN-NH$_2$ and HMSN-NH$_2$-EGF

Figure S3 Score plot on PC1 and PC2 of EGF, HMSNs, HMSN-NH$_2$ and HMSN-NH$_2$-EGF
Quantify the EGF attachments on HMSNs

1. Normalization
The intensities of samples were normalized by Equation (S1) and the results were presented in Table S1

\[
I' = \frac{I - I_0}{I_e - I_0}
\]  

(S1)

where \(I_e\) and \(I_o\) are detected intensities of pure EGF and HMSNs-NH\(_2\), while \(I\) and \(I'\) are the intensities obtained before and after the normalization.

2. Grafting efficiency of EGF (\(E\))
The efficiency of EGF grafting of each sample was calculated using Equation (S2) and the results were listed in Table S1

\[
E = \left( \frac{l_1'I_1}{l_1'I_1 + l_2'I_2} + \frac{l_2'I_2}{l_1'I_1 + l_2'I_2} \right) \times 100\%
\]  

(S2)
where \( I_1' \) and \( I_2' \) are normalized intensity of \( \text{CH}_5\text{N}_3^+ \) and \( \text{C}_4\text{H}_8\text{N}^+ \) fragments, respectively, and \( I_{e1} \) and \( I_{e2} \) are intensity of pure EGF corresponding to \( \text{CH}_5\text{N}_3^+ \) and \( \text{C}_4\text{H}_8\text{N}^+ \) fragments.

3. The quantity of EGF on HMSNs
The EGF concentration (\( \delta \)) on HMSNs was calculated via Equation (S3) and the data were shown in Table S1

\[
\delta = \frac{kC'E}{m}
\]  

(S3)

where \( k \) and \( C' \) are the volume of EGF solution and the EGF concentration used for the grafting procedure, and \( m \) is the mass of HMSNs-NH\(_2\) applied for the experiments.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>( I_1 )</th>
<th>( I_2 )</th>
<th>( I_1' )</th>
<th>( I_2' )</th>
<th>( I_1 )</th>
<th>( I_2 )</th>
<th>( E ) (%)</th>
<th>( \delta ) ( \mu\text{g} \text{ (EGF/mg(HMSN))} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immonium ions</td>
<td>CH(_5)N(_3^+)</td>
<td>C(_4)H(_8)N(^+)</td>
<td>CH(_3)N(_3^+)</td>
<td>C(_4)H(_8)N(^+)</td>
<td>1</td>
<td>1</td>
<td>100</td>
<td>-</td>
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<tr>
<td>Pure EGF</td>
<td>0.009139</td>
<td>0.014642</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
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<tr>
<td>HMSN-NH(_2)</td>
<td>0.001005</td>
<td>0.002011</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>HMSN-NH(_2)-EGF-0.1</td>
<td>0.002669</td>
<td>0.005656</td>
<td>0.2045</td>
<td>0.2885</td>
<td>25.63</td>
<td>0.8008</td>
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<tr>
<td>HMSN-NH(_2)-EGF-0.2</td>
<td>0.003324</td>
<td>0.006889</td>
<td>0.2851</td>
<td>0.3861</td>
<td>34.73</td>
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<td>HMSN-NH(_2)-EGF-0.4</td>
<td>0.004477</td>
<td>0.009042</td>
<td>0.4268</td>
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<td>HMSN-NH(_2)-EGF-0.8</td>
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<td>0.011858</td>
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<td>0.7795</td>
<td>74.72</td>
<td>18.68</td>
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</table>

4. Plot \( C' \) to \( \delta \)

The relationship between the original EGF concentration for grafting (\( C' \)) and the quantity of EGF on HMSNs (\( \delta \)) was investigated by plotting \( C' \) to \( \delta \). The results fitted very well to the model \( \delta = 25.75 C'^{1.52} \) with the \( R^2 \) of 0.999 (Figure S5).
Figure S5 Plot on $C'$ and $\delta$ and the fitting model of EGF grafted samples