Supporting information

Fig. S1 (A) Nanozymes stored at 4 degrees Celsius with a change in particle size. (B) XRD analysis of BSA, BSA@CeO, and BSA@CeO/Fe^{2+}. (C) The relative viabilities of 4T1 cells incubated with different concentrations of BSA@CeO and BSA@CeO/Fe^{2+} in pH=7.4 condition. (D) The relative viabilities of 4T1 cells incubated with different concentrations of BSA@CeO and BSA@CeO/Fe^{2+} in pH=6.5 condition.
**Figure S2** (A) Flow cytometry measurement of FITC fluorescence intensities in 4T1 cells after 2, 6, and 8 h of incubation with BSA@CeO, and BSA@CeO/Fe²⁺. (B) Cell cycle changes were determined by flow cytometry. (C) The relative viabilities of L-02 cells incubated with different concentrations of BSA@CeO and BSA@CeO/Fe²⁺. (D) The relative viabilities of HUVECs cells incubated with different concentrations of BSA@CeO and BSA@CeO/Fe²⁺.
Fig. S3 (A) The relative viabilities of HUVEC cells incubated with different concentrations of BSA@CeO and BSA@CeO/Fe$^{2+}$. (B) Clonogenic survival assay of HUVEC cells treated with PBS or BSA@CeO and BSA@CeO/Fe$^{2+}$ under a series of radiation doses at 0, 2, 4, 6, and 8 Gy. (C) Fluorescence images of the intracellular ROS in HUVECs after different treatments. (D) γ-H2AX immufluorescence images of DNA double-strand damage in L-02 after different treatments. (Each experiment was conducted at normal condition (pH=7.4))
The blood of mice treated with or without nanozymes were analyzed at different times. (A) ALT and AST in the blood, the albumin/globin ratios and the Blood urea nitrogen (BUN). (B) Blood routine analysis. White blood cells, red blood cells, hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, and platelets.
**Table S1**

Content of cerium and iron in nanomaterials by ICP-OES

<table>
<thead>
<tr>
<th>Sample</th>
<th>Sampling quality /g</th>
<th>Constant volume/ml</th>
<th>Dilution coefficient</th>
<th>Measured element</th>
<th>Instrument reading</th>
<th>Company</th>
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<tbody>
<tr>
<td>BSA@CeO solution</td>
<td>0.9151</td>
<td>25</td>
<td>1</td>
<td>Ce</td>
<td>7.4743</td>
<td>mg/L</td>
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<tr>
<td>BSA@CeO powder</td>
<td>0.0219</td>
<td>50</td>
<td>50</td>
<td>Ce</td>
<td>0.3035</td>
<td>mg/L</td>
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<tr>
<td>BSA@CeO/Fe^{2+}solution</td>
<td>1.0021</td>
<td>25</td>
<td>1</td>
<td>Fe</td>
<td>0.2357</td>
<td>mg/L</td>
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<tr>
<td>BSA@CeO/Fe^{2+}powder</td>
<td>0.0132</td>
<td>25</td>
<td>1</td>
<td>Fe</td>
<td>0.3572</td>
<td>mg/L</td>
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<tr>
<td>BSA@CeO/Fe^{2+}solution</td>
<td>1.0021</td>
<td>25</td>
<td>1</td>
<td>Ce</td>
<td>8.4318</td>
<td>mg/L</td>
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**Table S2**

Cell cycle changes were determined by flow cytometry.

<table>
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<tr>
<th>Sample</th>
<th>G1</th>
<th>G2/M</th>
<th>S</th>
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<tbody>
<tr>
<td>Control</td>
<td>38%</td>
<td>0%</td>
<td>62%</td>
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<tr>
<td>BSA@CeO</td>
<td>70.77%</td>
<td>0%</td>
<td>29.23%</td>
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<tr>
<td>BSA@CeO/Fe^{2+}</td>
<td>62.9%</td>
<td>0%</td>
<td>37.1%</td>
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<tr>
<td>Control+X-ray</td>
<td>9.65%</td>
<td>71.84%</td>
<td>18.51%</td>
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<tr>
<td>BSA@CeO+X-ray</td>
<td>18.07%</td>
<td>45.59%</td>
<td>36.34%</td>
</tr>
<tr>
<td>BSA@CeO/Fe^{2+}+X-ray</td>
<td>17.17%</td>
<td>41.90%</td>
<td>40.95%</td>
</tr>
</tbody>
</table>

**Table S3**

Measurement heart, liver, spleen, and lung kidneys of inoculated diplonemid mice with or without X-ray by ICP-MS.

<table>
<thead>
<tr>
<th>Tissues</th>
<th>BSA@CeO (Ce: mg/kg)</th>
<th>BSA@CeO/Fe^{2+} (Ce: mg/kg)</th>
<th>BSA@CeO/Fe^{2+} (Fe: mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>heart</td>
<td>126.86</td>
<td>1.68</td>
<td>185.66</td>
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<tr>
<td>liver</td>
<td>1.37</td>
<td>15.68</td>
<td>38.93</td>
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<tr>
<td>spleen</td>
<td>774.37</td>
<td>115.48</td>
<td>647.55</td>
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<tr>
<td>lung</td>
<td>96.11</td>
<td>3.06</td>
<td>102.81</td>
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<tr>
<td>kidney</td>
<td>99.46</td>
<td>3.33</td>
<td>118.99</td>
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