

## Supplemental Information

### Cube-octameric silsesquioxane-mediated cargo peptide delivery into living cancer cells

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##### Microirradiation experiment and subsequent co-localization of fluorescently labeled PCNA-binding peptide and RFP-labeled PCNA after the addition of compound 4

- Fig. S18: Fluorescence microscopic analysis of irradiated HeLa cells

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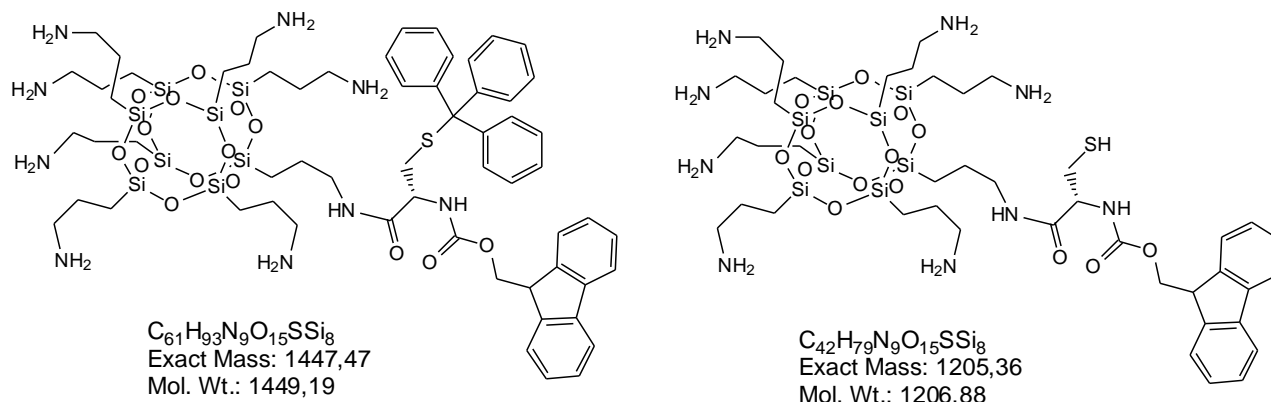
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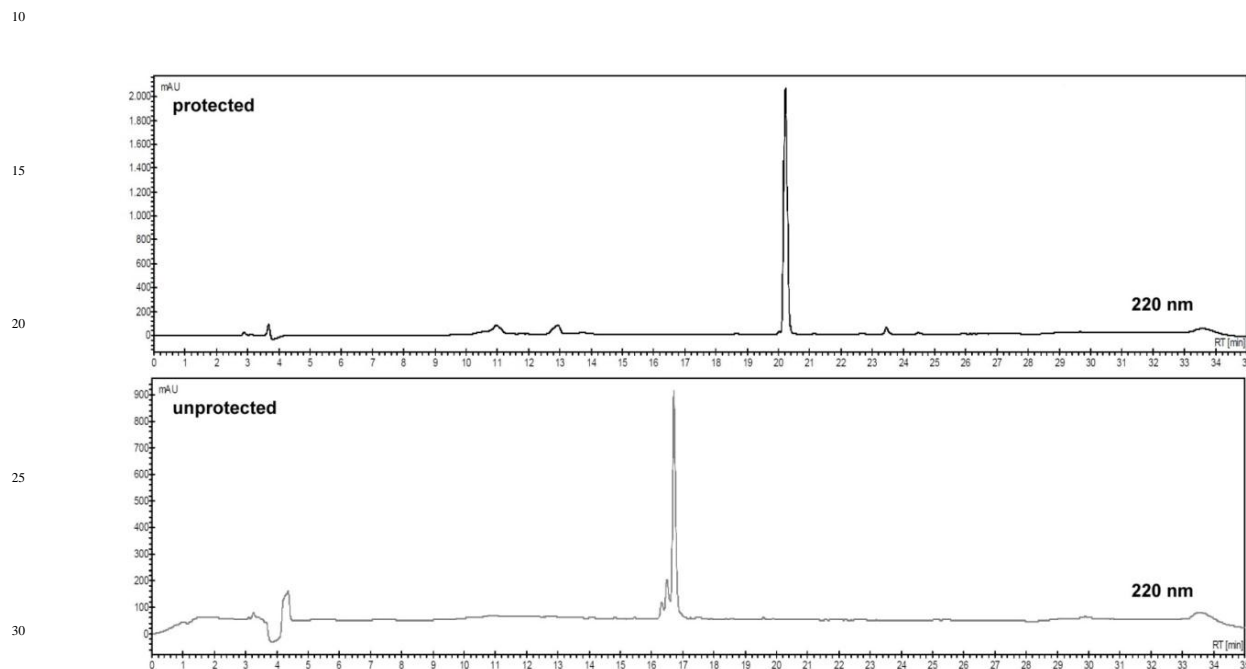
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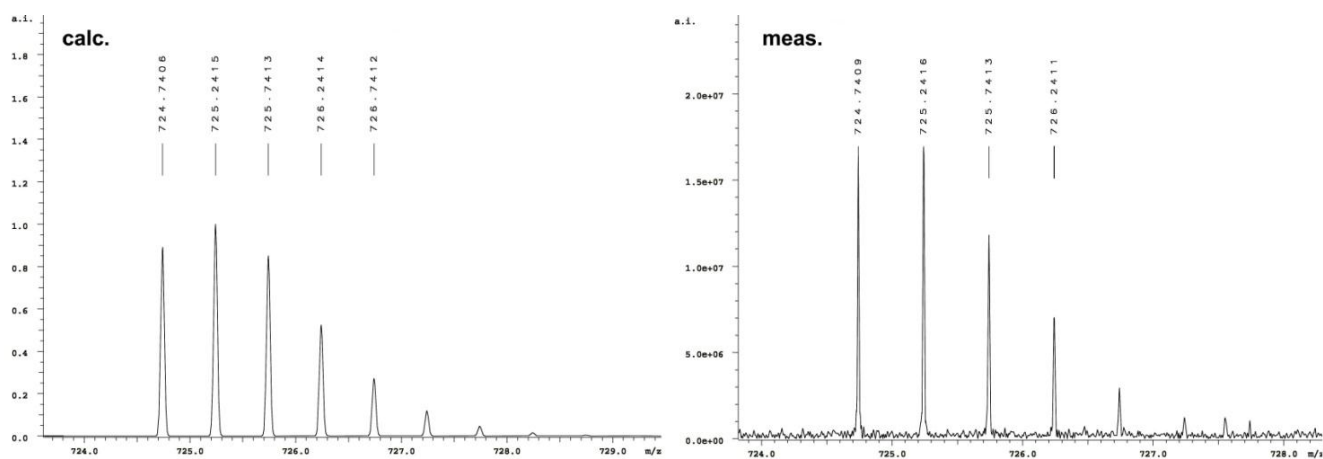
**Compound 2 (Fmoc-L-cysteine heptaamino-COSS) and 2a (Fmoc-(S-trityl)-L-cysteine heptaamino-COSS)**



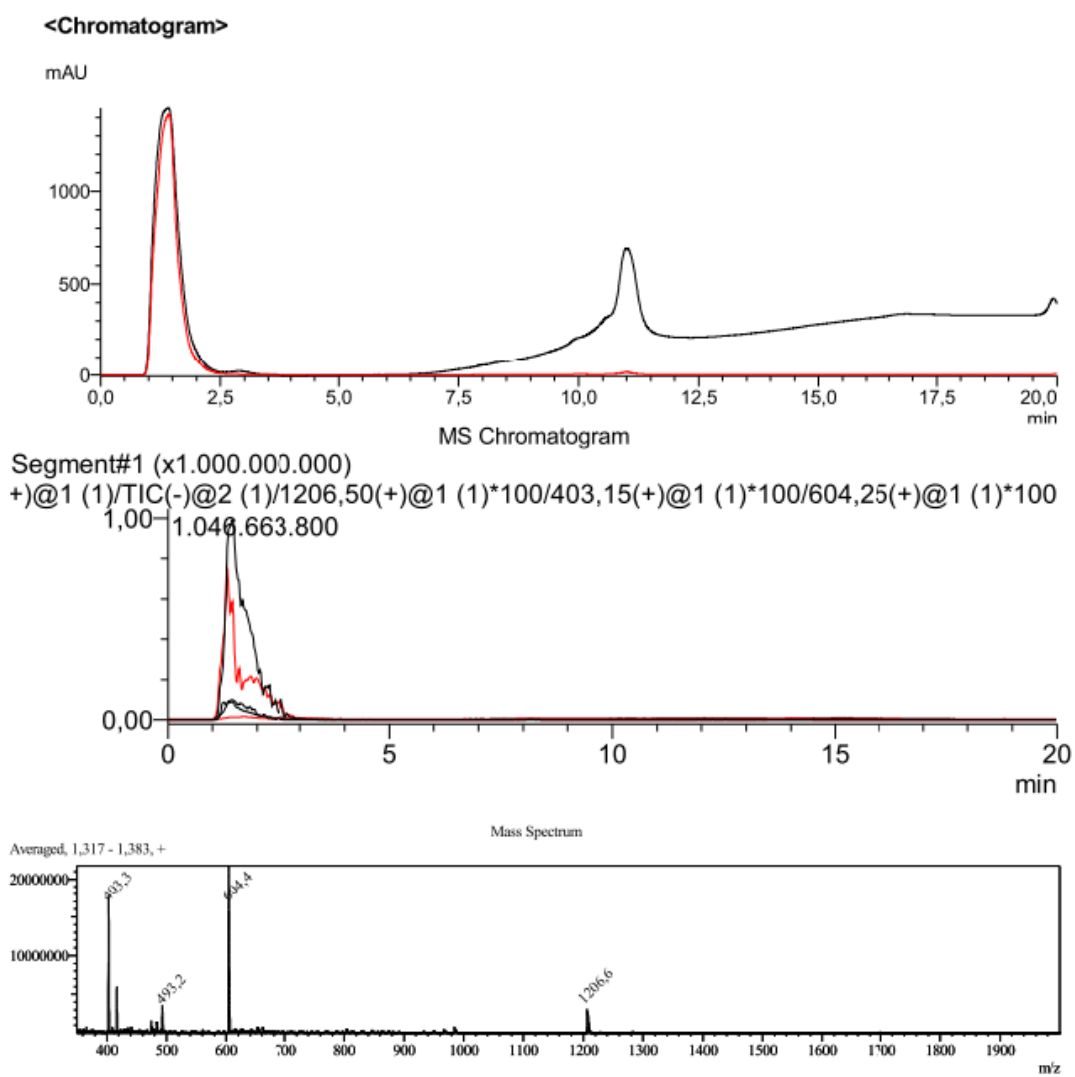
**Fig. S1:** Chemical structure of Fmoc-(S-trityl)-L-cysteine heptaamino-COSS **2a** (left) and unprotected Fmoc-L-cysteine heptaamino-COSS **2** (right).



**Fig. S2:** Analytical RP-HPLC traces of trityl-protected (**2a**) and deprotected Fmoc-L-cysteine heptaamino-COSS **2**. (Varian 940-LC equipped with a Phenomenex Luna C<sub>18</sub> column (5 $\mu$ , 100 A, 250 $\times$ 4.60 mm, 5  $\mu$ m). Eluent A: 0.1% aq. trifluoroacetic acid (TFA), eluent B: 90 % aq. acetonitrile in 0.1% aq. TFA; 10  $\rightarrow$  80% B in 20 min preceded by 5 min isocratic 10 % B at a flow rate of 1 mL min<sup>-1</sup>).

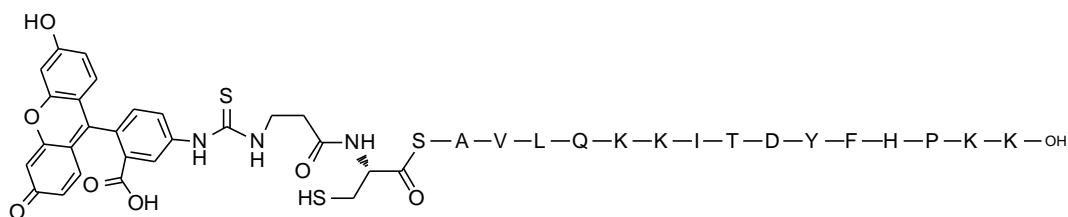


**Fig. S3:** HR-MS measurement of compound **2a**; left: calculated isotopic pattern  $[M+2H]^{2+} = 724.7406$ ; right: measured isotopic pattern  $[M+2H]^{2+} = 724.7409$ .



**Fig. S4** LC-MS (ESI) measurement of compound **2**.

### Compound 3 (fluorescein-labeled PCNA binding peptide)



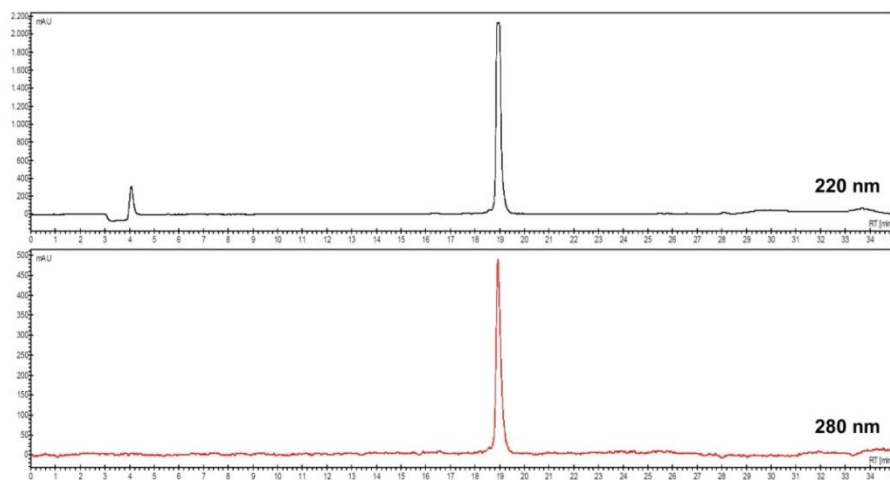
Chemical Formula: C<sub>116</sub>H<sub>164</sub>N<sub>26</sub>O<sub>30</sub>S<sub>2</sub>

Exact Mass: 2465,15

Molecular Weight: 2466,83

**Fig. S5:** Amino acid sequence and chemical structure of fluorescein-labeled PCNA binding peptide **3**.

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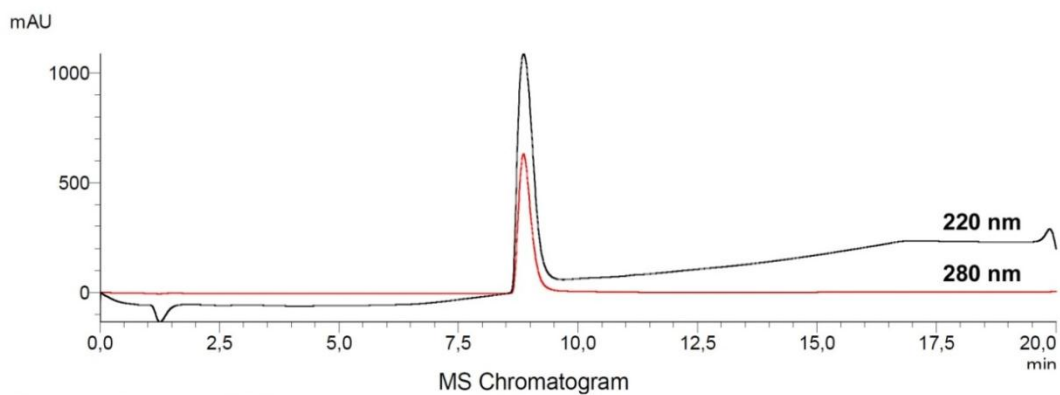
**Fig. S6:** Analytical RP-HPLC traces of FITC-labeled PCNA binding peptide **3** (Varian 940-LC equipped with a *Phenomenex* Luna C<sub>18</sub> column (5u, 100 A, 250×4.60 mm, 5 μm). Eluent A: 0.1% aq. trifluoroacetic acid (TFA), eluent B: 90 % aq. acetonitrile in 0.1% aq. TFA; 25 → 50% B in 20 min preceded by 5 min isocratic 25 % B at a flow rate of 1 mL min<sup>-1</sup>).

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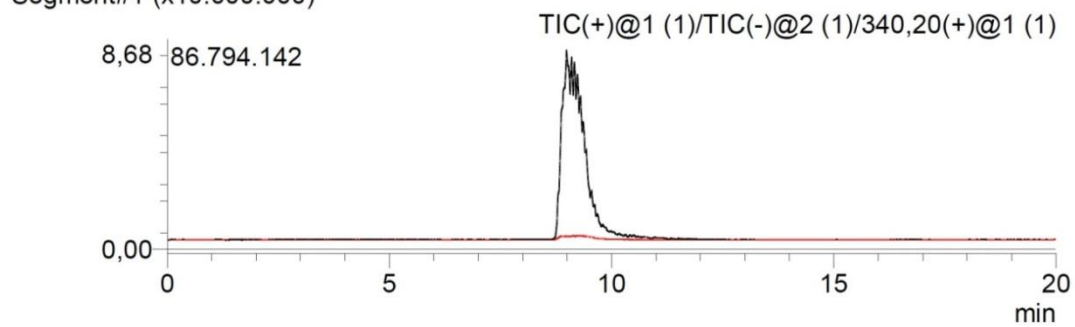
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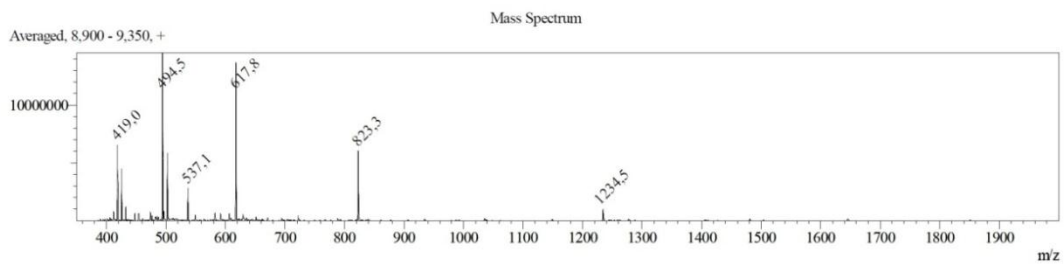
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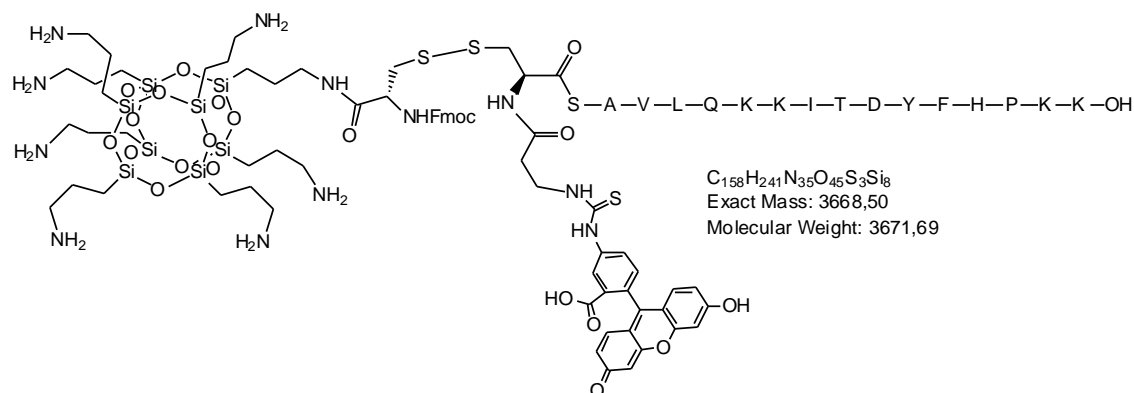


**Fig. S7:** LC-MS (ESI) measurement of the purified fluorescein-labeled PCNA binding peptide **3**.

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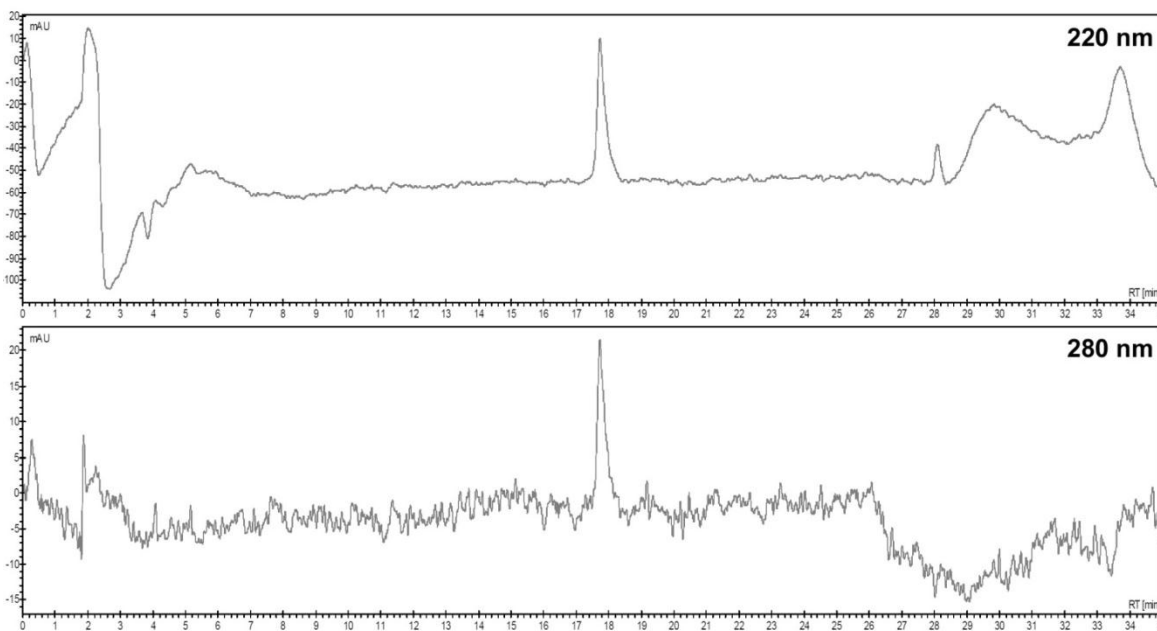
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### Compound 4 (fluorescently labeled PCNA binding peptide coupled to Fmoc-L-cysteine heptaamino-COSS)



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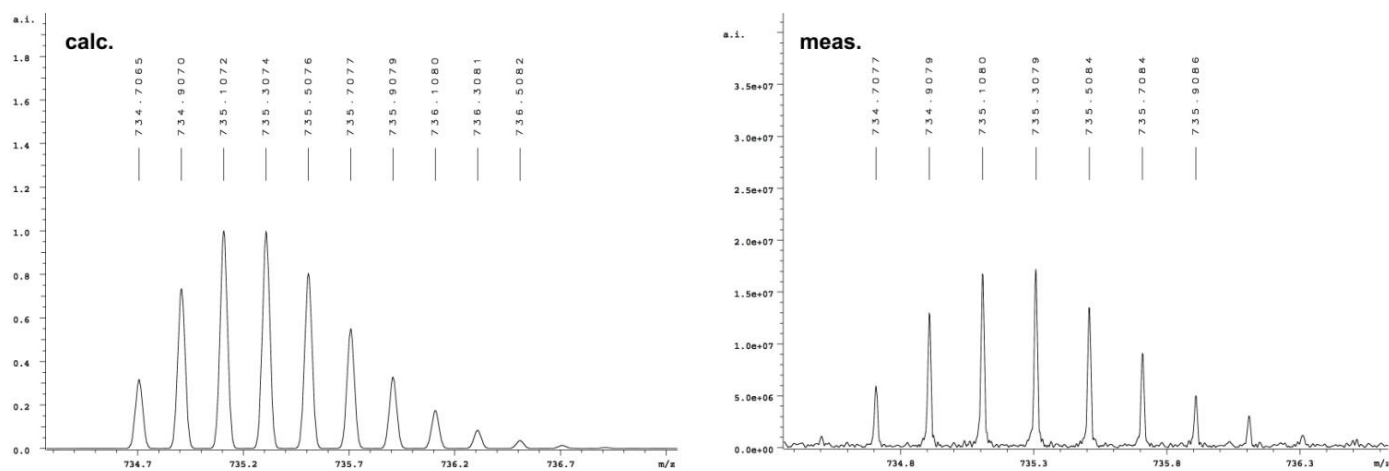
Fig. S8: Chemical structure of compound 4.



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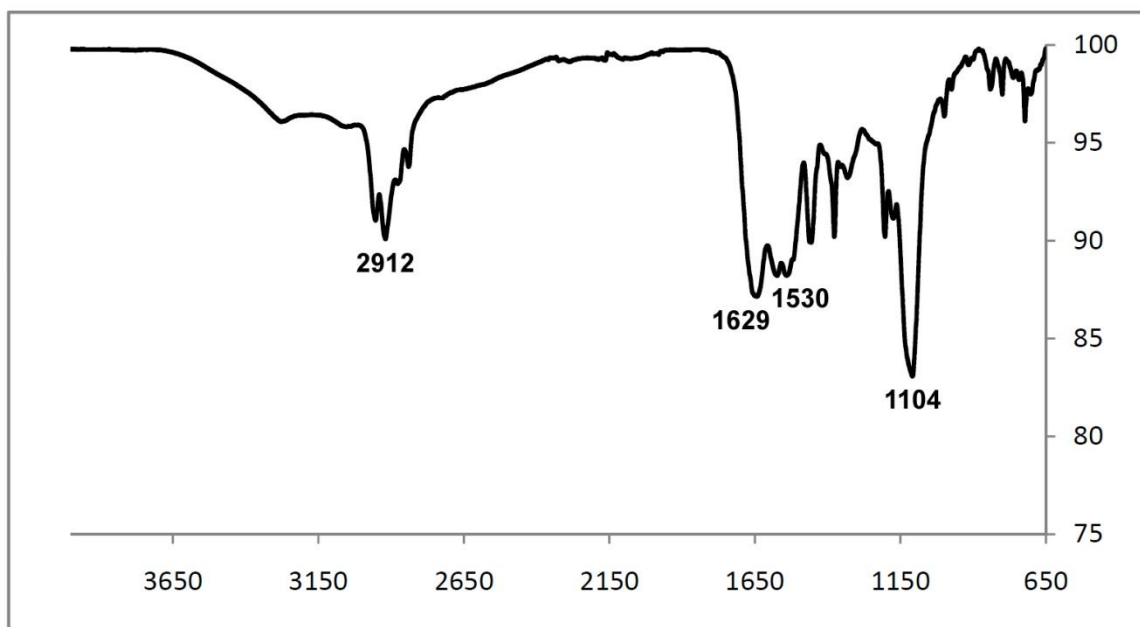
Fig. S9: Analytical RP-HPLC traces of compound 4 (Varian 940-LC equipped with a Phenomenex Luna  $C_{18}$  column (5 $\mu$ , 100 Å, 250×4.60 mm, 5  $\mu$ m). Eluent A: 0.1% aq. trifluoroacetic acid (TFA), eluent B: 90 % aq. acetonitrile in 0.1% aq. TFA; 25 → 50% B in 20 min preceded by 5 min isocratic 10 % B at a flow rate of 1 mL min<sup>-1</sup>).

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**Fig. S10:** HR-MS measurement of compound **4**; left: calculated isotopic pattern  $[M+5H]^{5+} = 734.7065$ ; right: measured isotopic pattern  $[M+5H]^{5+} = 734.7077$ .

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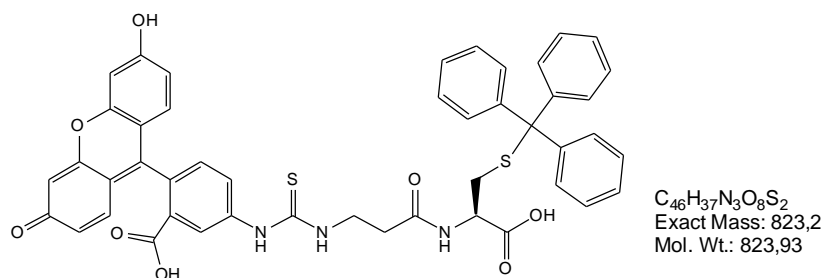


**Fig. S11:** FT-IR spectrum of compound **4**.

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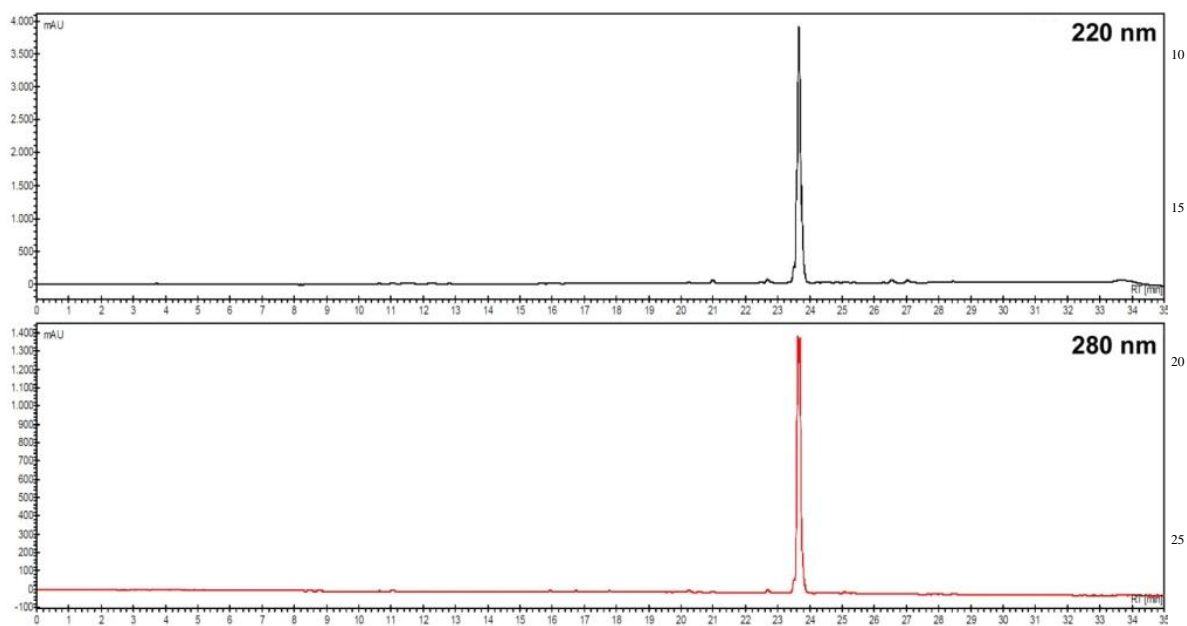
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**Compound 5 (cysteine- $\beta$ -alanine-fluorescein heptaamino-COSS), 5a (cysteine-(S-trityl)- $\beta$ -alanine-fluorescein), and 5b (cysteine-(S-trityl)- $\beta$ -alanine-fluorescein heptaamino-COSS)**



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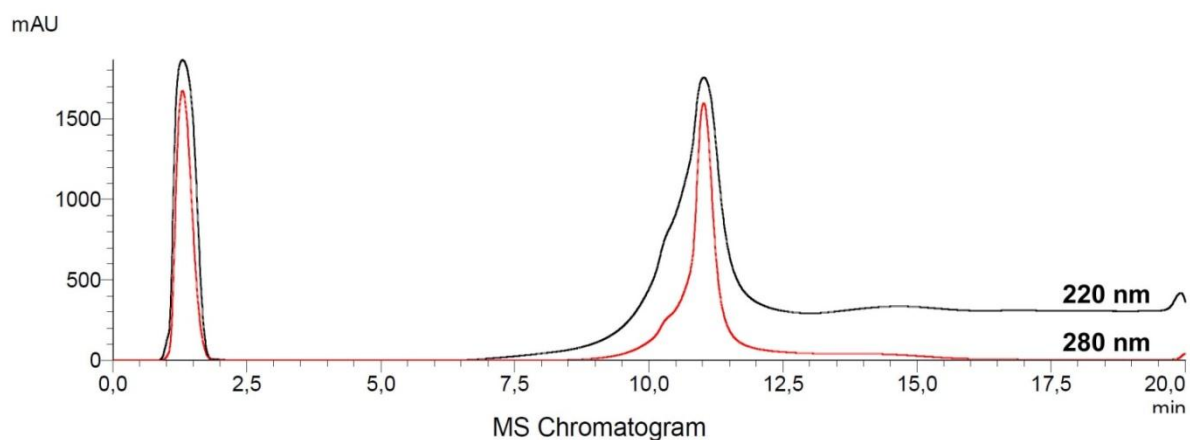
**Fig. S12:** Chemical structure of compound **5a**.



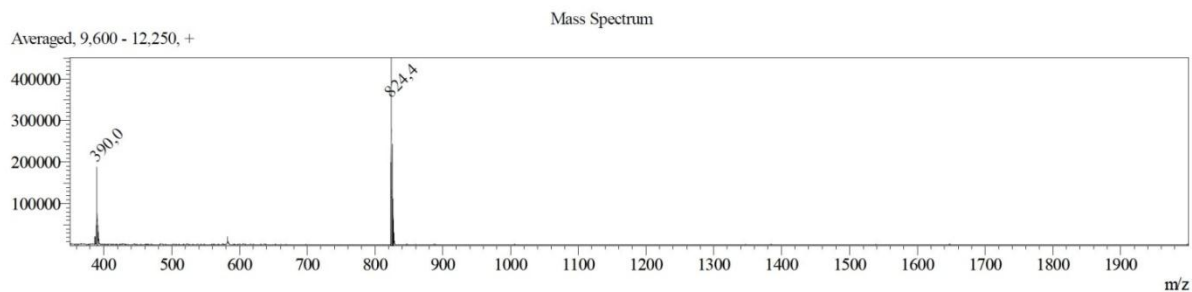
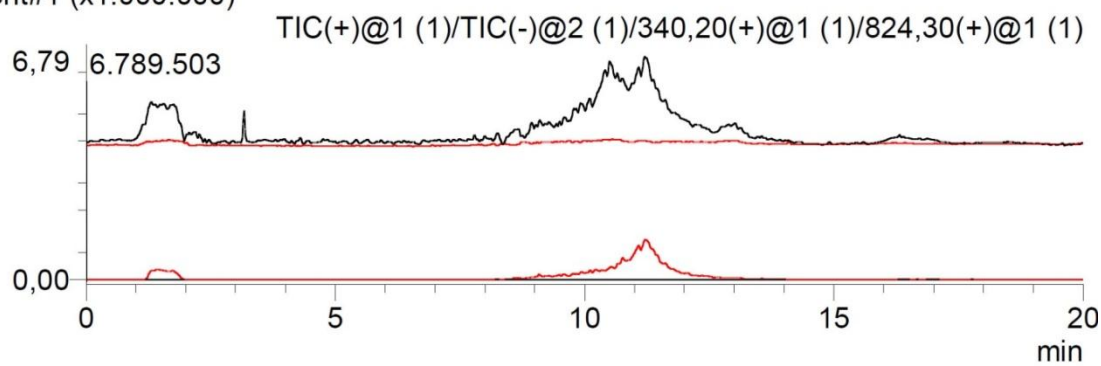
**Fig. S13:** Analytical RP-HPLC traces of compound **5a**. (Varian 940-LC equipped with a *Phenomenex* Luna  $C_{18}$  column (5 $\mu$ , 100 A, 250 $\times$ 4.60 mm, 5  $\mu$ m). Eluent A: 0.1% aq. trifluoroacetic acid (TFA), eluent B: 90 % aq. acetonitrile in 0.1% aq. TFA; 10  $\rightarrow$  100% B in 20 min preceded by 5 min isocratic 10 % B at a flow rate of 1 mL min $^{-1}$ ).



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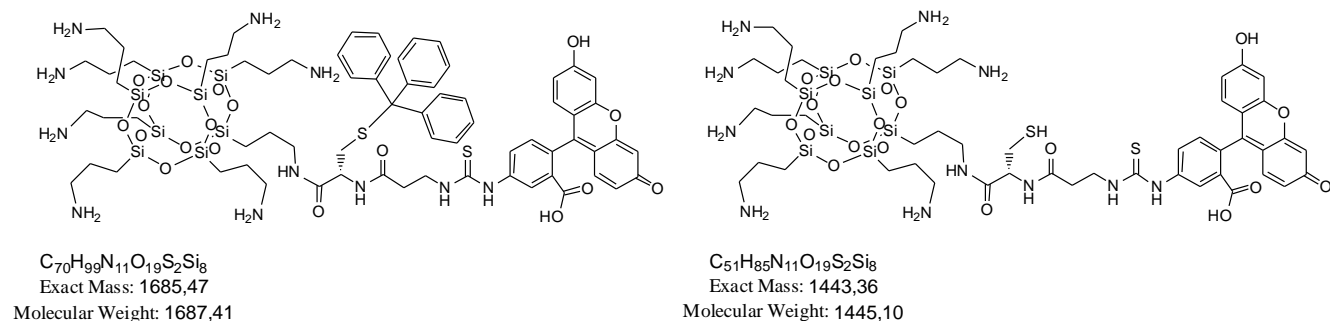


**Fig. S14:** LC-MS (ESI) measurement of compound **5a**.

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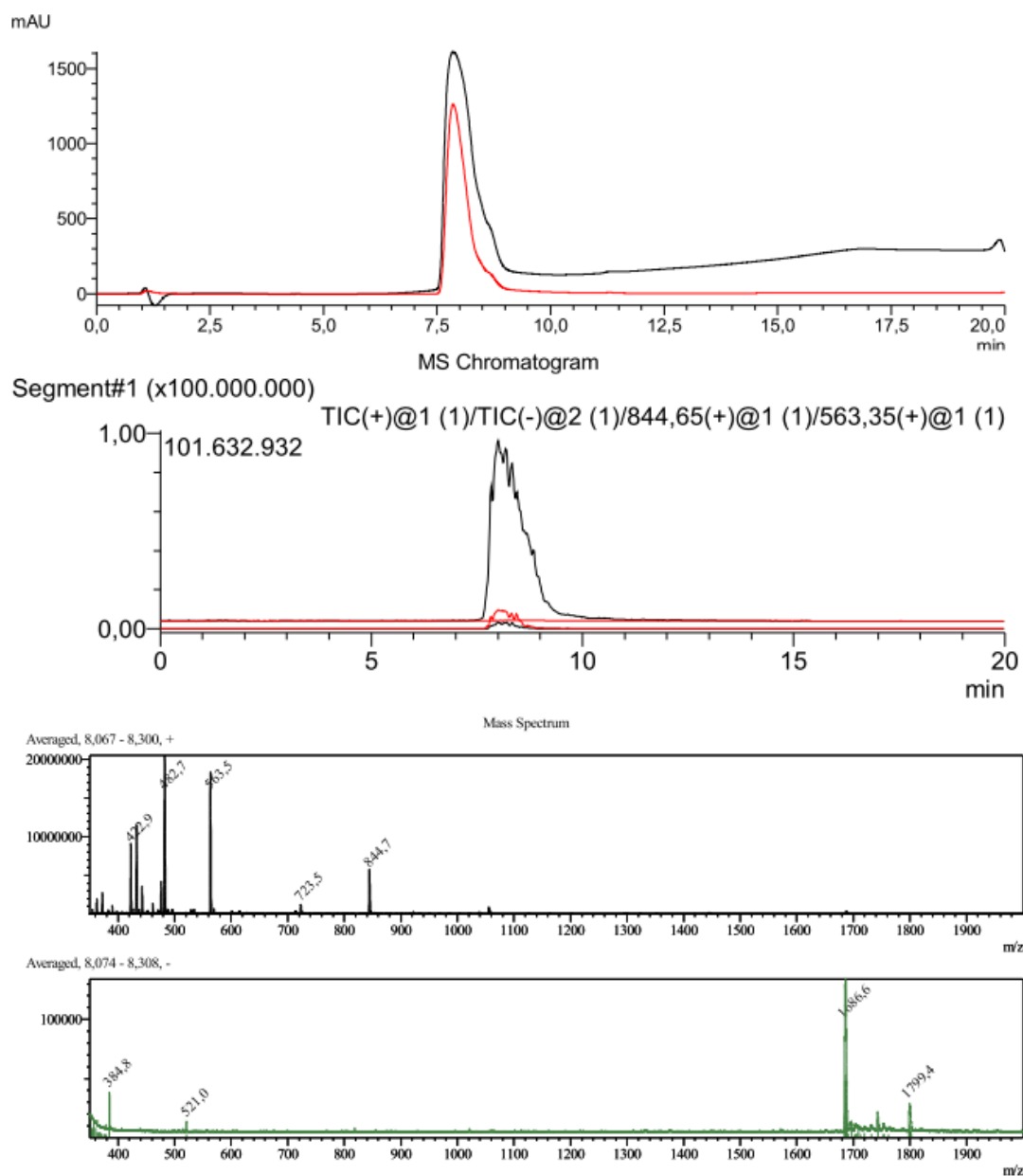
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Supplemental Information

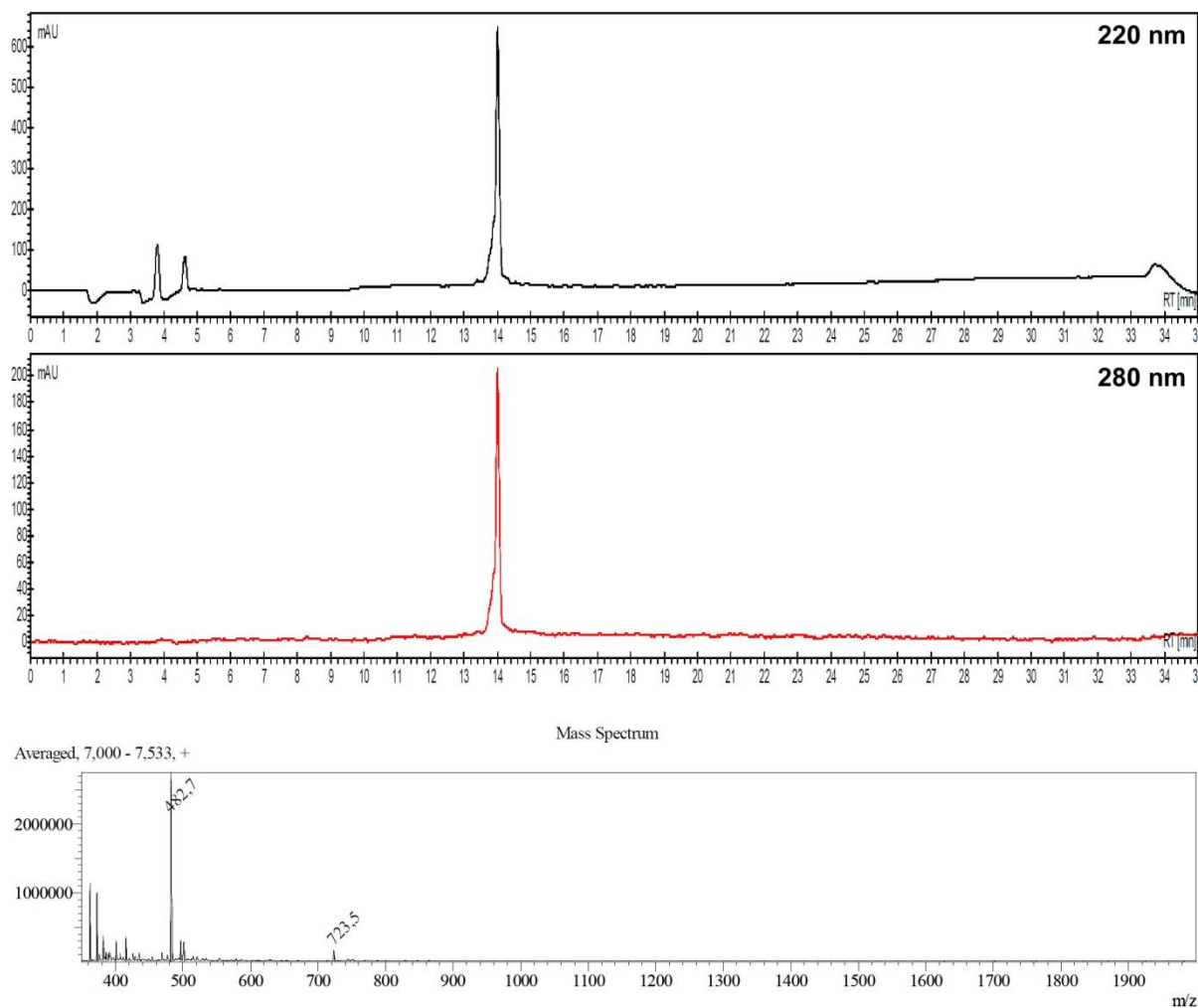


**Fig. S15:** Chemical structures of trityl protected **5b** (left) and unprotected cysteine- $\beta$ -alanine-fluorescein heptaamino-COSS **5** (right).

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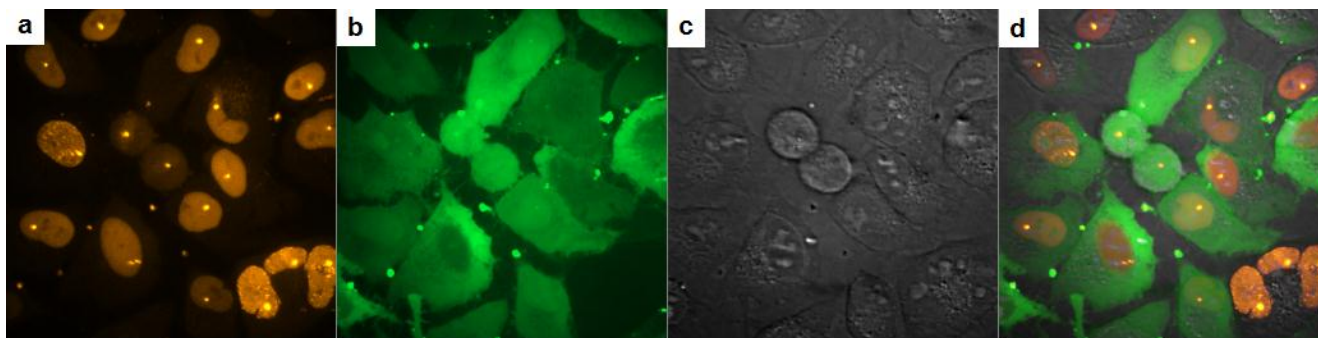
**Fig. S16:** LC-MS (ESI) measurement of cysteine-(S-trityl)- $\beta$ -alanine-fluorescein heptaamino-COSS **5b**.



**Fig. S17:** Analytical RP-HPLC traces (*Varian 940-LC* equipped with a *Phenomenex Luna C<sub>18</sub>* column (5 $\mu$ , 100 A, 250 $\times$ 4.60 mm, 5  $\mu$ m). Eluent A: 0.1% aq. trifluoroacetic acid (TFA), eluent B: 90 % aq. acetonitrile in 0.1% aq. TFA; 10  $\rightarrow$  100% B in 20 min preceded by 5 min isocratic 10 % B at a flow rate of 1 mL min<sup>-1</sup>) and MS analysis of cysteine- $\beta$ -alanine-fluorescein heptaamino-COSS **5**.

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### Microirradiation experiment and subsequent co-localization of fluorescently labeled PCNA binding peptide and RFP labeled PCNA after the addition of compound **4**



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**Fig. S18:** Fluorescence microscopic analysis of irradiated HeLa cells 30 minutes after the addition of compound **4**. (a) PCNA (red); (b) cleaved fluorescein-labeled peptide **3** (green); (c) contrast image ; (d) overlay.