Nanomotor-Enabled pH-Responsive Intracellular Delivery of Caspase-3: Toward Rapid Cell Apoptosis

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SUPPORTING INFORMATION

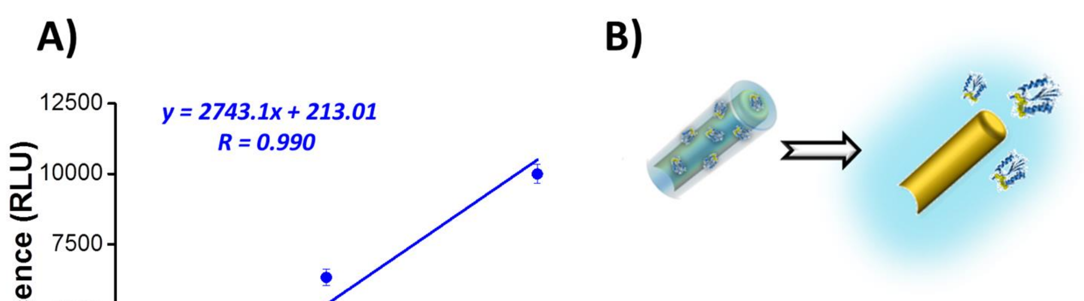
1. Supporting Videos description

Supporting Video S1. US-propelled pH-responsive polymer-CASP-3@AuNW approaching an AGS cell (US field: 6 V and 2.56 MHz).

Supporting Video S2. Comparison of US-propulsion of AuNWs and pH-responsive polymer-CASP-3@AuNWs (US field: 6 V and 2.56 MHz).

Supporting Video S3. Dense aggregation of AGS cells (light spheres) and pH-responsive polymer-CASP-3@AuNWs (black rods) attached to the surface of the cells and inside the cells due to the US field (6 V and 2.56 MHz).

2. Supporting Figures



Sample	Luminescence (RLU)	CASP-3 (ng)
Free CASP-3 released from nanomotors	8978	3.4

Figure S1. *Estimation of CASP-3 loading on the nanomotors. (A) Calibration of CASP-3 obtained by using the Caspase-Glo® 3/7 Assay, and (B) calculated amount of CASP-3 from enzyme-loaded nanomotors (mean value calculated from the average of 3 measurements)*

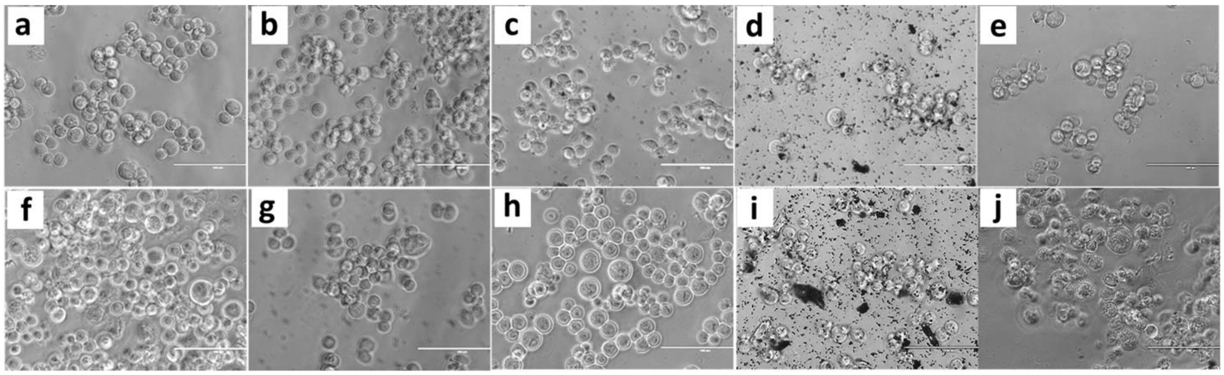


Figure S2. *Optical microscope images corresponding to untreated cells (a), and cells treated with: only US (b), US-powered-polymer-AuNWs (no CASP-3) (c), static-polymer-CASP-3@AuNWs (d), CASP-3 released from motors and static conditions (e), 3.4 ng of free CASP-3 under static conditions (f), CASP-3 released from motors and US conditions (g), 3.4 ng of free CASP-3 under US conditions (h), US-powered-polymer-CASP-3@AuNWs (i) and Triton X-100 (j).*

3. Supporting Table

Table S1. Comparison of CASP-3-based apoptosis strategies.

Strategy	CASP-3 amount	Apoptosis time	Apoptosis, %	Reference
Lipid-mediated intracellular delivery	3.3 ng	o/n	58.0	1
BioPorter™ Protein delivery reagent	250 ng	2 days	80.0	2
Intracellular delivery with NP-Stabilized Nanocapsules	7.5×10^{8} ng	1 h	72.0	3
Intracellullar delivery by PLGA-CNTs conjugates	3,000 ng/mL	3 days	70.0	4
Intracellular delivery by cell-penetrating Poly(disulfide)s	50 nM	2 h	50.0	5
Intracellular delivery based on reversible and specific assembly of His-tagged CASP-3 onto soluble Ni-immobilized polymer	1,536 ng	1 day	80.0	6
Au-nanosurface energy transfer probe for real-time monitoring of cell apoptosis	3.75 ng	3 h	70.0	7
Intracellular delivery by US-propelled polymer/CASP-3@AuNWs	3.4 ng	5 min	80.0	This work

4. References

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