Particle & Particle Systems Characterization

Supporting Information

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Tuning the Bandgap and Cytotoxicity of ZnO by Tailoring the Nanostructures

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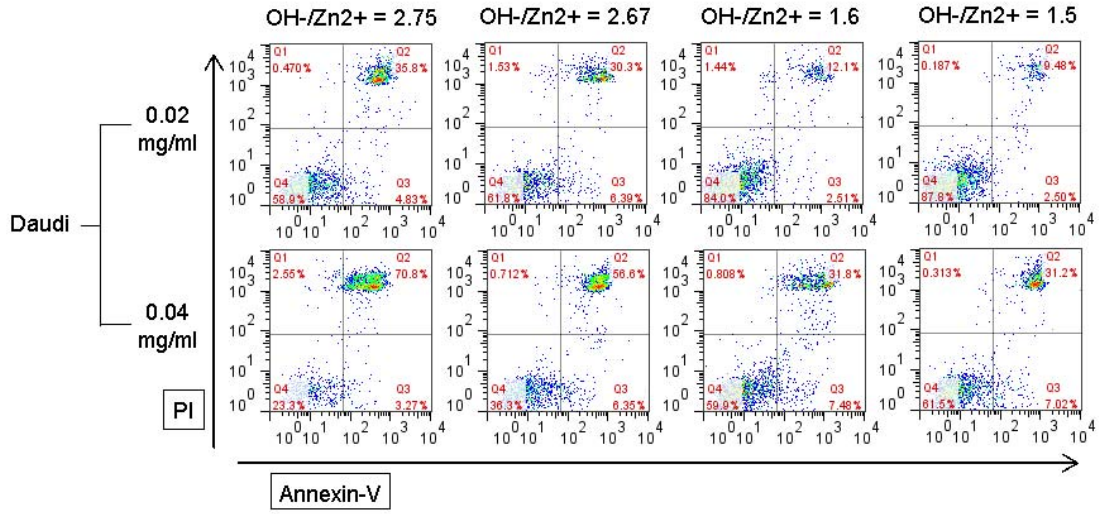
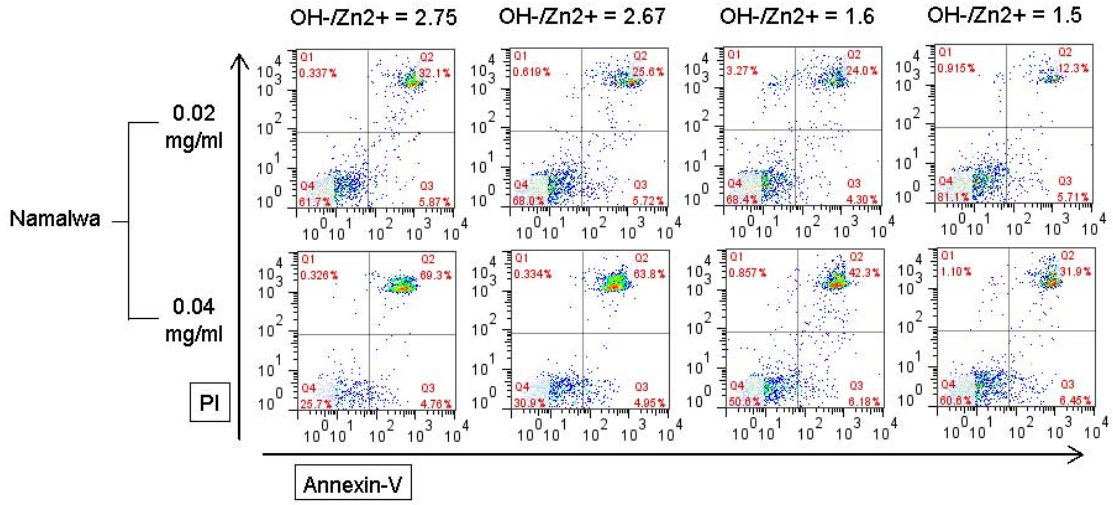

OH-/Zn2+ = 2.75
OH-/Zn2+ = 2.67
OH-/Zn2+ = 1.6
OH-/Zn2+ = 1.5
Daudi
0.02 mg/ml
0.04 mg/ml
PI
Annexin-V


OH-/Zn2+ = 2.75
OH-/Zn2+ = 2.67
OH-/Zn2+ = 1.6
OH-/Zn2+ = 1.5
Namalwa
0.02 mg/ml
0.04 mg/ml
PI
Annexin-V

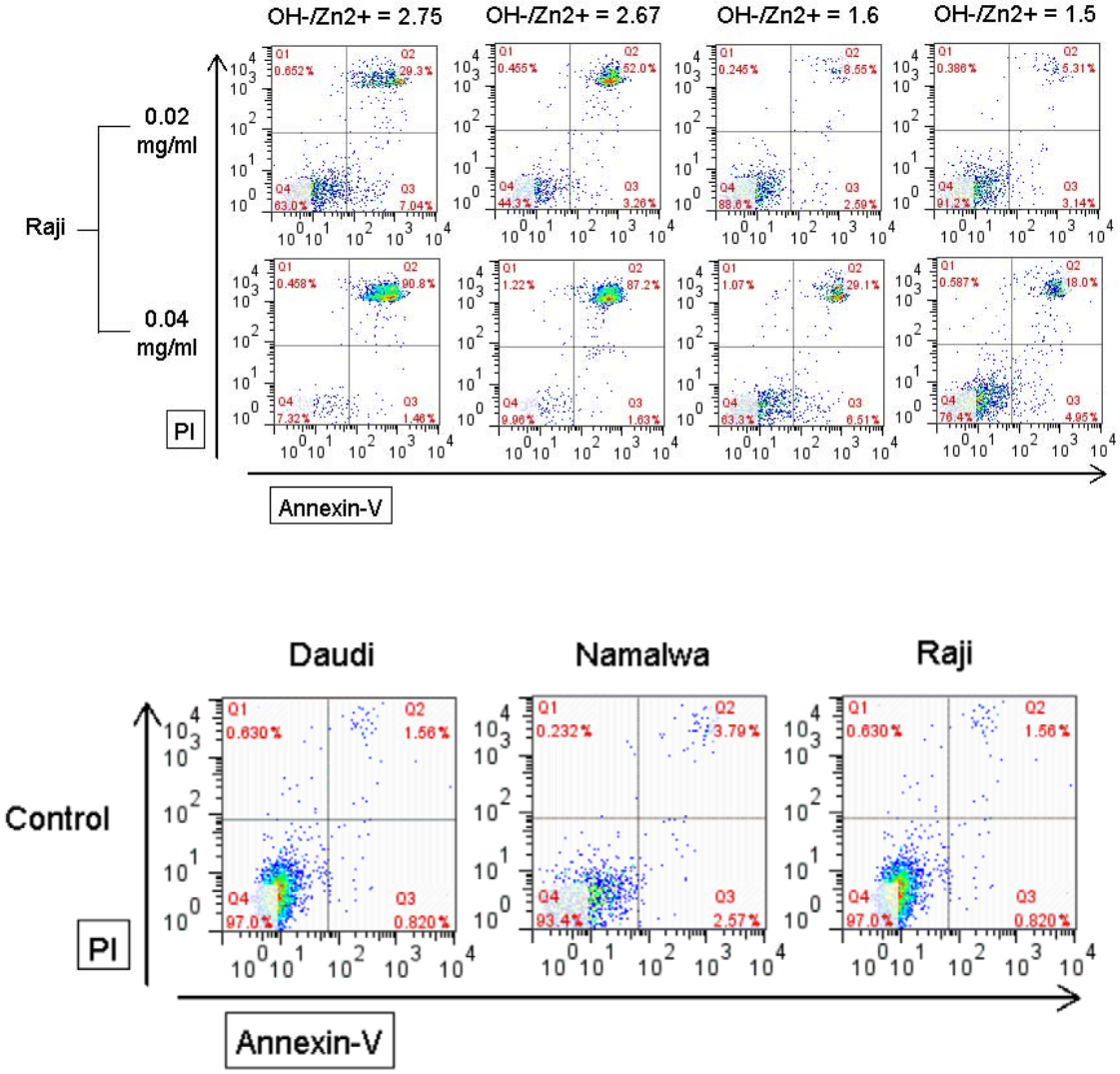


Figure S1. Typical quadrant statistics for cell death assays of Daudi, Namalwa, and Raji cells, treated by 0.02 and 0.04 mg/mL of ZnO NPs made with different OH^-/Zn^{2+} ratio for 24 h.

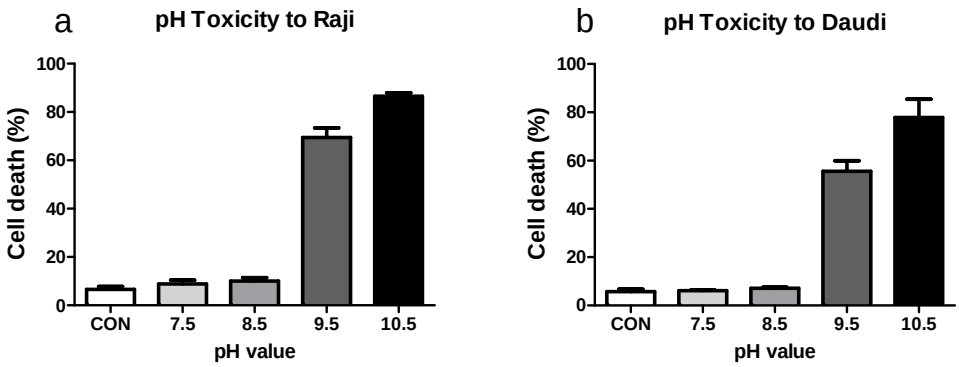


Figure S2. Cell death of Raji (a) and Daudi (b) at different pH values after 24 h of treatment.

As shown in Figure S2, the OH^- ions are very toxic to both Raji and Daudi cells, and even the low OH^- concentration down to 0.03 mM (pH = 9.5) is fatal to cells.

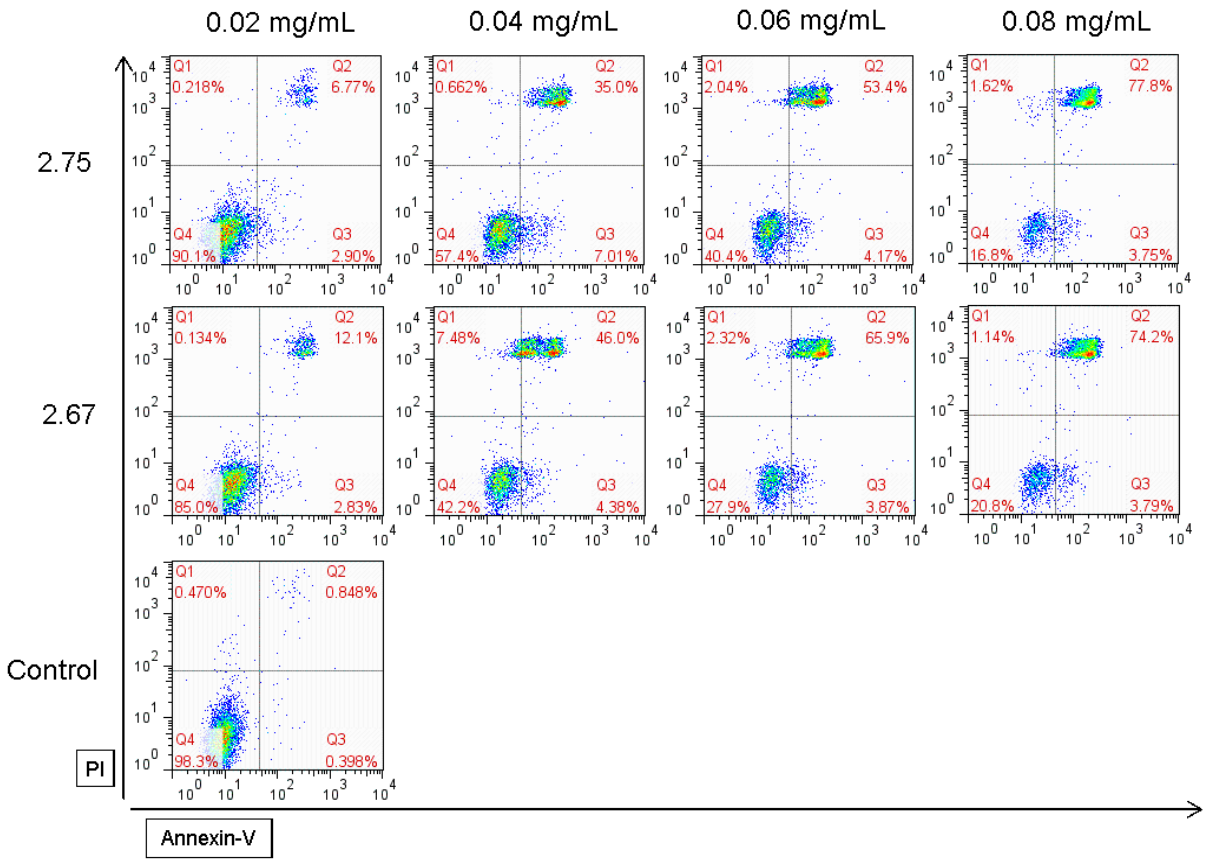


Figure S3. Typical quadrant statistics for cell death assays of Raji cells, treated by ZnO NPs made with OH^-/Zn^{2+} ratios of 2.75 (10.5 mV) and 2.67 (-22.6 mV) after water washing at different concentrations for 24 h.

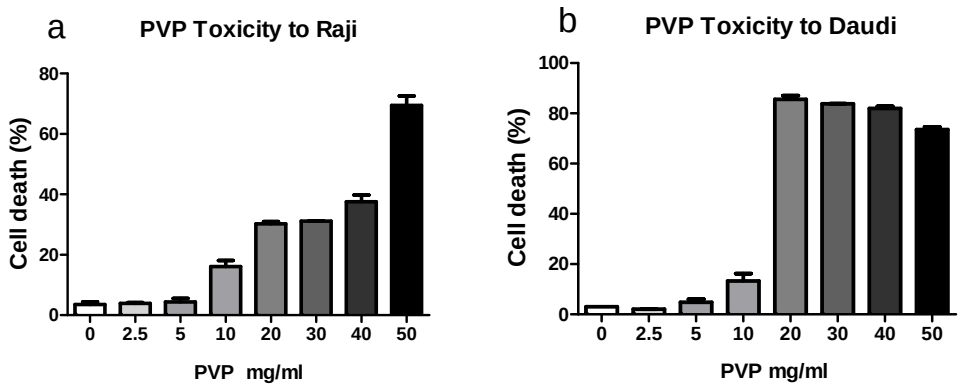


Figure S4. Cell death of Raji (a) and Daudi (b) at different PVP concentrations after 24 h of treatment.

As shown in Figure S4, PVP has negligible toxicity to both Raji and Daudi below 10 mg/mL.

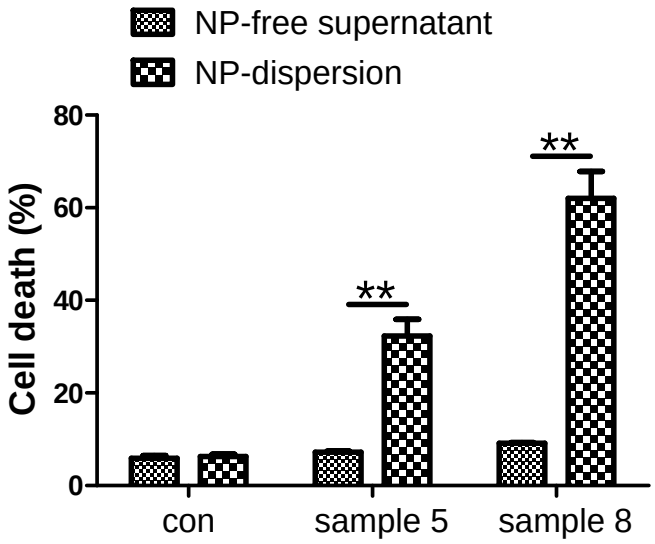


Figure S5. Following 24 h treatment, the cell death of Raji cells induced by the NP-free supernatants separated from the dispersions of samples 5 and 8 (0.04 mg/ml) prepared for the cytotoxicity assay after being stored 24 h; the corresponding cell death of the same NP-dispersions was also recorded for control.

The most toxic NPs made with high OH^-/Zn^{2+} ratios of 2.75 (sample 5) and 2.67 (sample 8) to Raji cells were weighted and reconstituted in phosphate buffered saline (PBS) solution to the desired stock concentration. After reconstitution, ZnO NPs were sonicated for 30 min and then washed with PBS for 3 times. The obtained NPs was reconstituted with RPMI 1640 and 10% FBS to the concentration of 0.04 mg/ml, and then be stored for 24 hours to mimic the possible dissolution procedure during the NP cytotoxicity assay. The ZnO NPs were removed by centrifuging at 15000xg for 50min, and the obtained NP-free supernatant was immediately vortexed prior to addition to cell cultures. Following 24 h treatment, the supernatant-induced cytotoxicity to B lymphoma cell lines Raji was assessed using Propidium iodide (PI) and Annexin V.

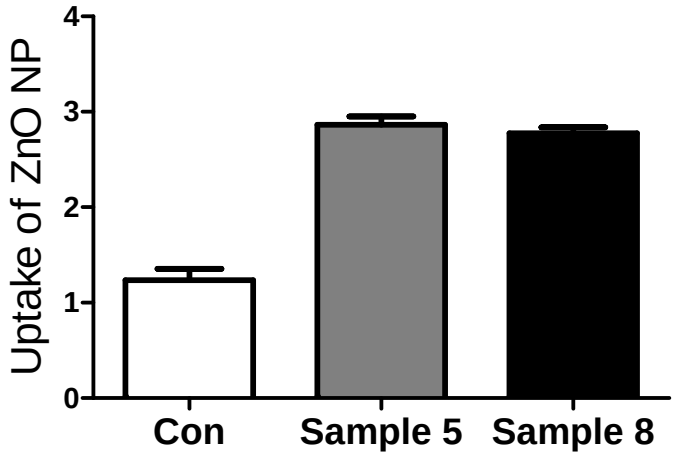


Figure S6 Uptake of samples 5 and 8 as well as corresponding control without NPs in Raji cells after 1 h of treating.

Cellular uptake of ZnO-NPs in Raji cells was examined by flow cytometry. The approach is based on analysis of forward scatter (FSC) versus side scatter (SSC) of measured samples. The SSC value in control cells was subtracted to calculate the SSC distribution ratio in the particle-treated cells for the cellular uptake assay. Cells were incubated with 0.04 mg/mL of ZnO NPs for 1 h, and then washed three times with PBS. After centrifugation, cells were re-suspended in 200ul PBS for flow cytometry. Following gating, control and particle-exposed cells were run and plotted to examine the increase in SSC.

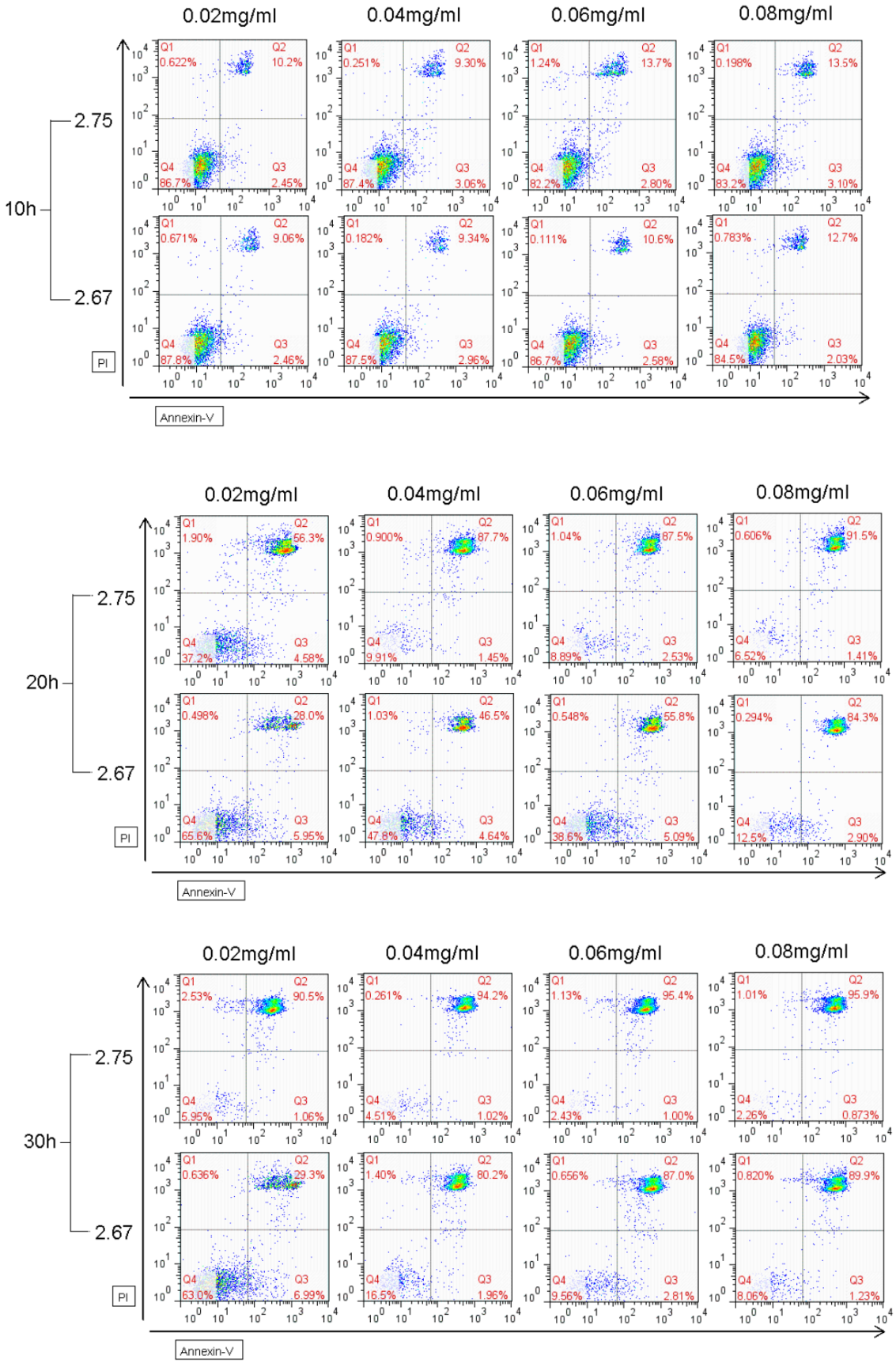

0.02mg/ml
0.04mg/ml
0.06mg/ml
0.08mg/ml
10h
20h
30h
2.75
2.67
PI
Annexin-V

Figure S7. Typical quadrant statistics for cell death assays of Raji cells, treated by ZnO NPs made with OH^-/Zn^{2+} ratios of 2.75 (10.5 mV) and 2.67 (-22.6 mV) at different concentrations for 10, 20, and 30 h.