

Electronic supplementary information

Multi-endpoint assessments for *in vitro* nano-bio interactions and uptake of biogenic phosphorus nanomaterials using HEK293 cells

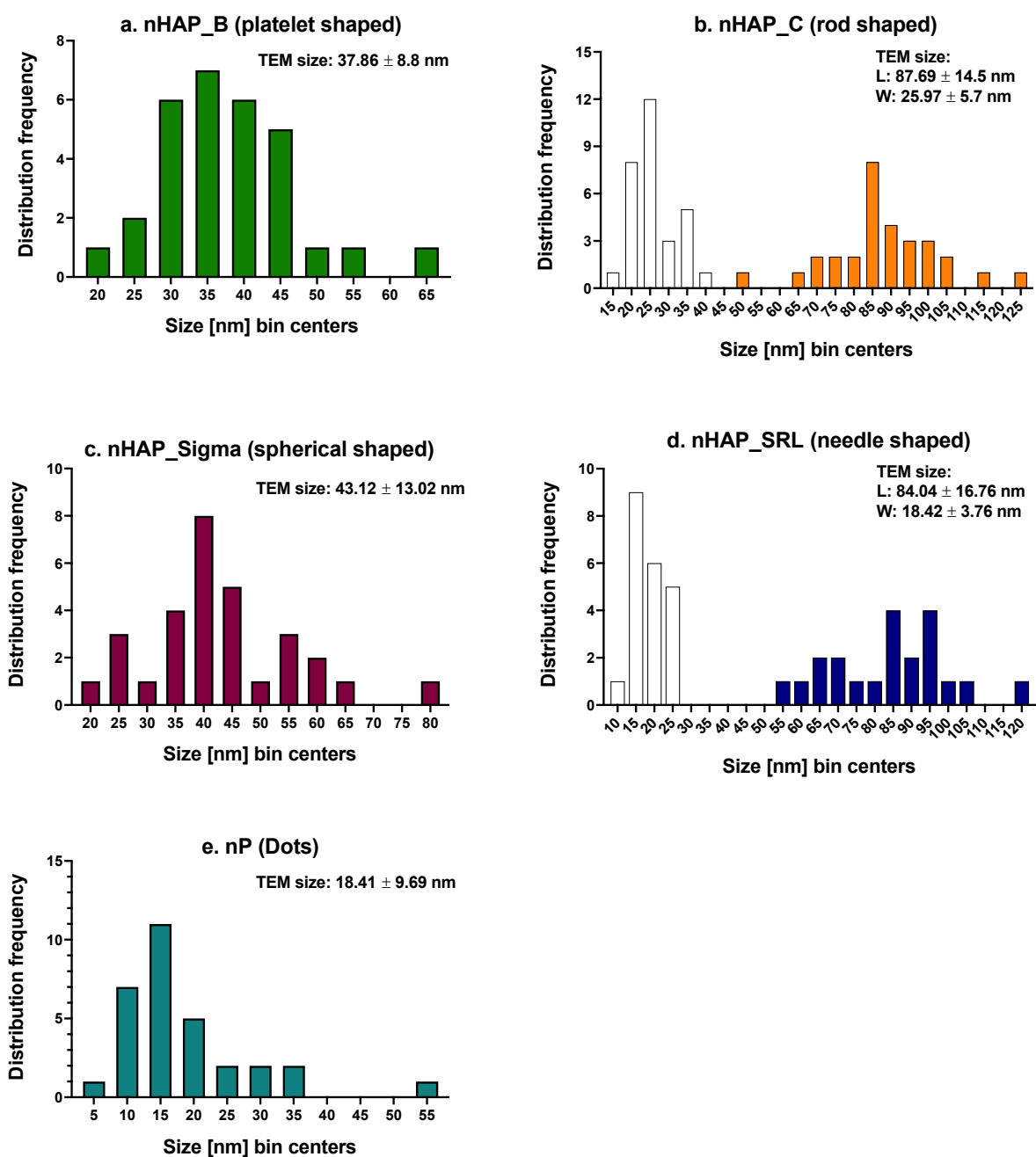
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ESI figure 1. Histograms (bin centre: 5) showing size distribution as obtained from TEM for a. nHAP_B, b. nHAP_C, c. nHAP_Sigma, d. nHAP_SRL and e. nP.

Table 1. Total number of particles for different concentrations ($1.5 - 1000 \mu\text{g.mL}^{-1}$) of nHAP_B, nHAP_C, nHAP_Sigma, nHAP_SRL and nP.

Concentration	Total no. of particles				
	nHAP_B	nHAP_C	nHAP_Sigma	nHAP_SRL	nP
1.5625	2.07E+16	1.04E+16	2.43E+16	4.91E+16	7.56E+15
3.125	4.14E+16	2.08E+16	4.85E+16	9.81E+16	1.51E+16
6.25	8.28E+16	4.17E+16	9.71E+16	1.96E+17	3.03E+16
12.5	1.66E+17	8.34E+16	1.94E+17	3.92E+17	6.05E+16

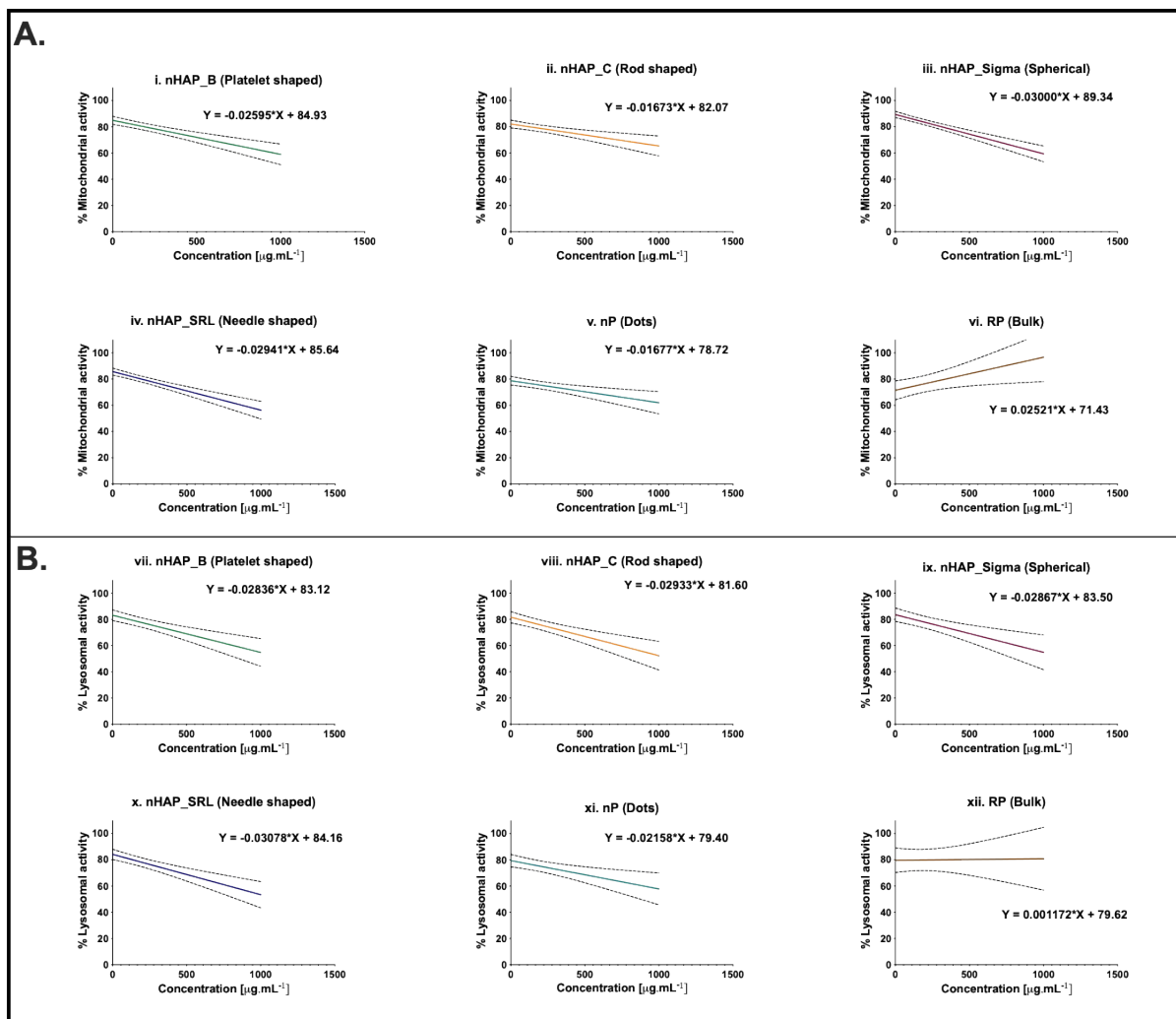
25	3.31E+17	1.67E+17	3.88E+17	7.85E+17	1.21E+17
50	6.63E+17	3.33E+17	7.77E+17	1.57E+18	2.42E+17
100	1.33E+18	6.67E+17	1.55E+18	3.14E+18	4.84E+17
200	2.65E+18	1.33E+18	3.11E+18	6.28E+18	9.68E+17
500	6.63E+18	3.33E+18	7.77E+18	1.57E+19	2.42E+18
1000	1.33E+19	6.67E+18	1.55E+19	3.14E+19	4.84E+18

Table 2. Number of particles undergoing sedimentation for different concentrations (1.5 – 1000 $\mu\text{g}\cdot\text{mL}^{-1}$) of nHAP_B, nHAP_C, nHAP_Sigma, nHAP_SRL and nP.

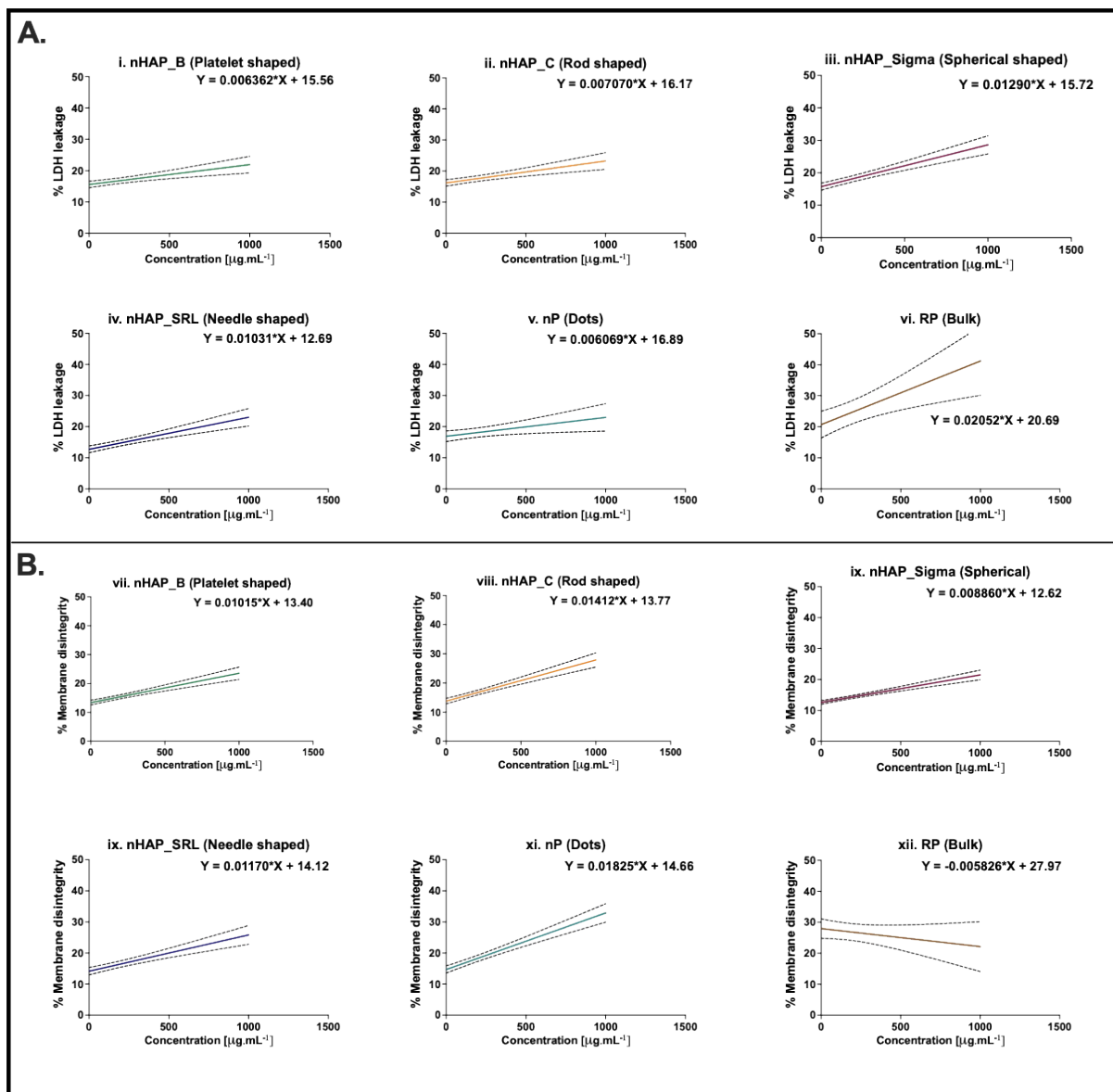
<i>Particles through sedimentation</i>					
<i>Concentration</i>	nHAP_B	nHAP_C	nHAP_Sigma	nHAP_SRL	nP
1.5625	4.7E+09	2.3E+09	5.5E+09	1.1E+10	1.7E+09
3.125	9.3E+09	4.7E+09	1.1E+10	2.2E+10	3.4E+09
6.25	1.9E+10	9.4E+09	2.2E+10	4.4E+10	6.8E+09
12.5	3.7E+10	1.9E+10	4.4E+10	8.8E+10	1.4E+10
25	7.4E+10	3.7E+10	8.7E+10	1.8E+11	2.7E+10
50	1.5E+11	7.5E+10	1.7E+11	3.5E+11	5.4E+10
100	3.0E+11	1.5E+11	3.5E+11	7.1E+11	1.1E+11
200	6.0E+11	3.0E+11	7.0E+11	1.4E+12	2.2E+11
500	1.5E+12	7.5E+11	1.7E+12	3.5E+12	5.4E+11
1000	3.0E+12	1.5E+12	3.5E+12	7.1E+12	1.1E+12

Table 3. Remaining number of particles with colloidal dispersion for different concentrations (1.5 – 1000 $\mu\text{g}\cdot\text{mL}^{-1}$) of nHAP_B, nHAP_C, nHAP_Sigma, nHAP_SRL and nP.

<i>Remaining no. of particles</i>					
<i>Concentration</i>	nHAP_B	nHAP_C	nHAP_Sigma	nHAP_SRL	nP
1.5625	2.07E+16	1.04E+16	2.43E+16	4.91E+16	7.56E+15
3.125	4.14E+16	2.08E+16	4.85E+16	9.81E+16	1.51E+16
6.25	8.28E+16	4.17E+16	9.71E+16	1.96E+17	3.03E+16
12.5	1.66E+17	8.34E+16	1.94E+17	3.92E+17	6.05E+16
25	3.31E+17	1.67E+17	3.88E+17	7.85E+17	1.21E+17
50	6.63E+17	3.33E+17	7.77E+17	1.57E+18	2.42E+17
100	1.33E+18	6.67E+17	1.55E+18	3.14E+18	4.84E+17
200	2.65E+18	1.33E+18	3.11E+18	6.28E+18	9.68E+17
500	6.63E+18	3.33E+18	7.77E+18	1.57E+19	2.42E+18
1000	1.33E+19	6.67E+18	1.55E+19	3.14E+19	4.84E+18



ESI Figure 2. Linear regression graph and equations in case of: **A.** MTT assay for mitochondrial activity in case of for (i.) nHAP_B, (ii.) nHAP_C, (iii.) nHAP_Sigma, (iv.) nHAP_SRL, (v.) nP and (vi.) RP; and **B.** Neutral red assay for lysosomal activity in case of (vii.) nHAP_B, (viii.) nHAP_C, (ix.) nHAP_Sigma, (x.) nHAP_SRL, (xi.) nP and (xii.) RP.



ESI Figure 3. Linear regression graph and equations in case of: **A.** Percentage membrane dis-integrity using LDH assay for (i.) nHAP_B, (ii.) nHAP_C, (iii.) nHAP_Sigma, (iv.) nHAP_SRL, (v.) nP and (vi.) RP; and **B.** Percentage membrane dis-integrity using trypan blue assay for (vii.) nHAP_B, (viii.) nHAP_C, (ix.) nHAP_Sigma, (x.) nHAP_SRL, (xi.) nP and (xii.) RP.