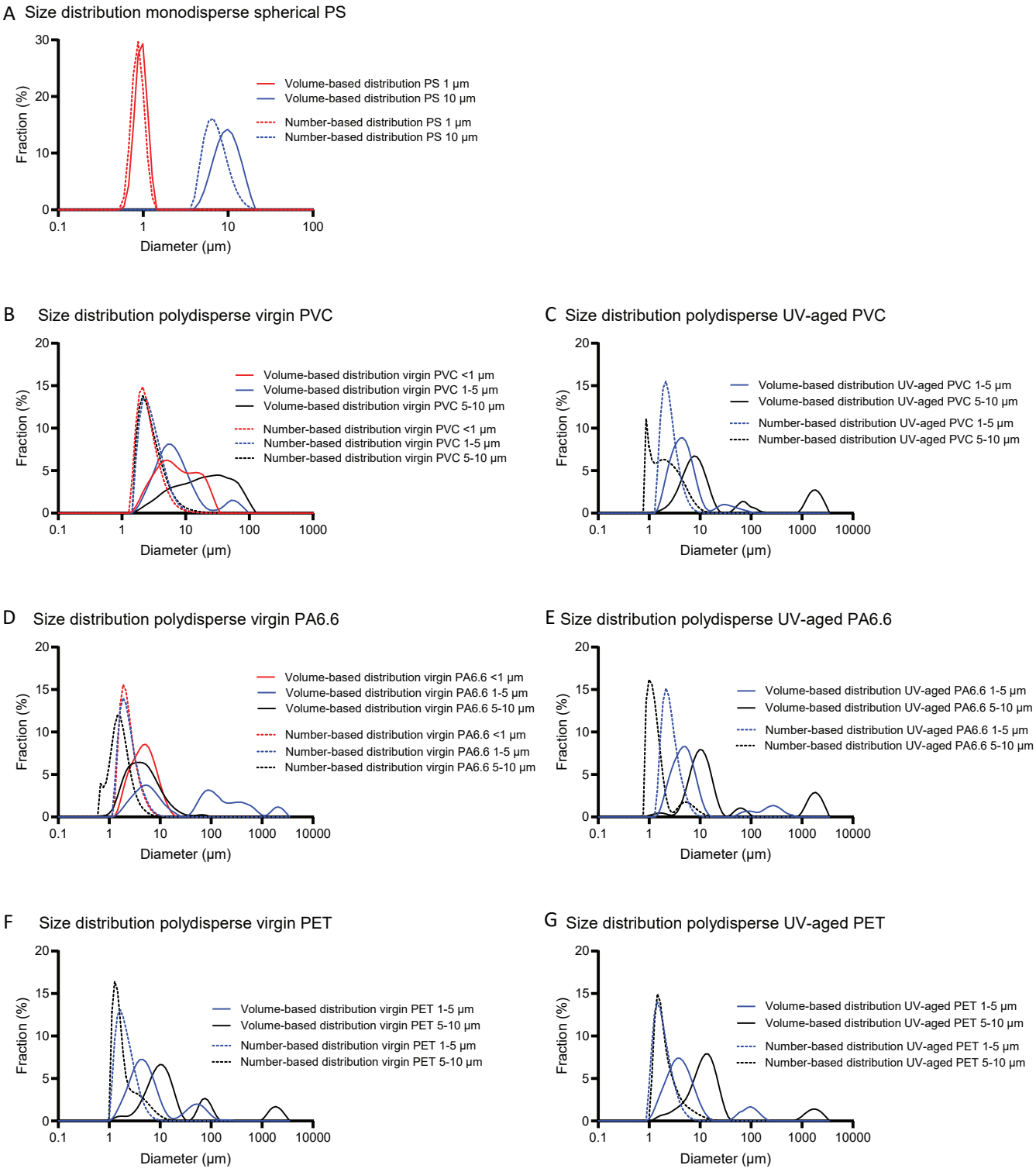
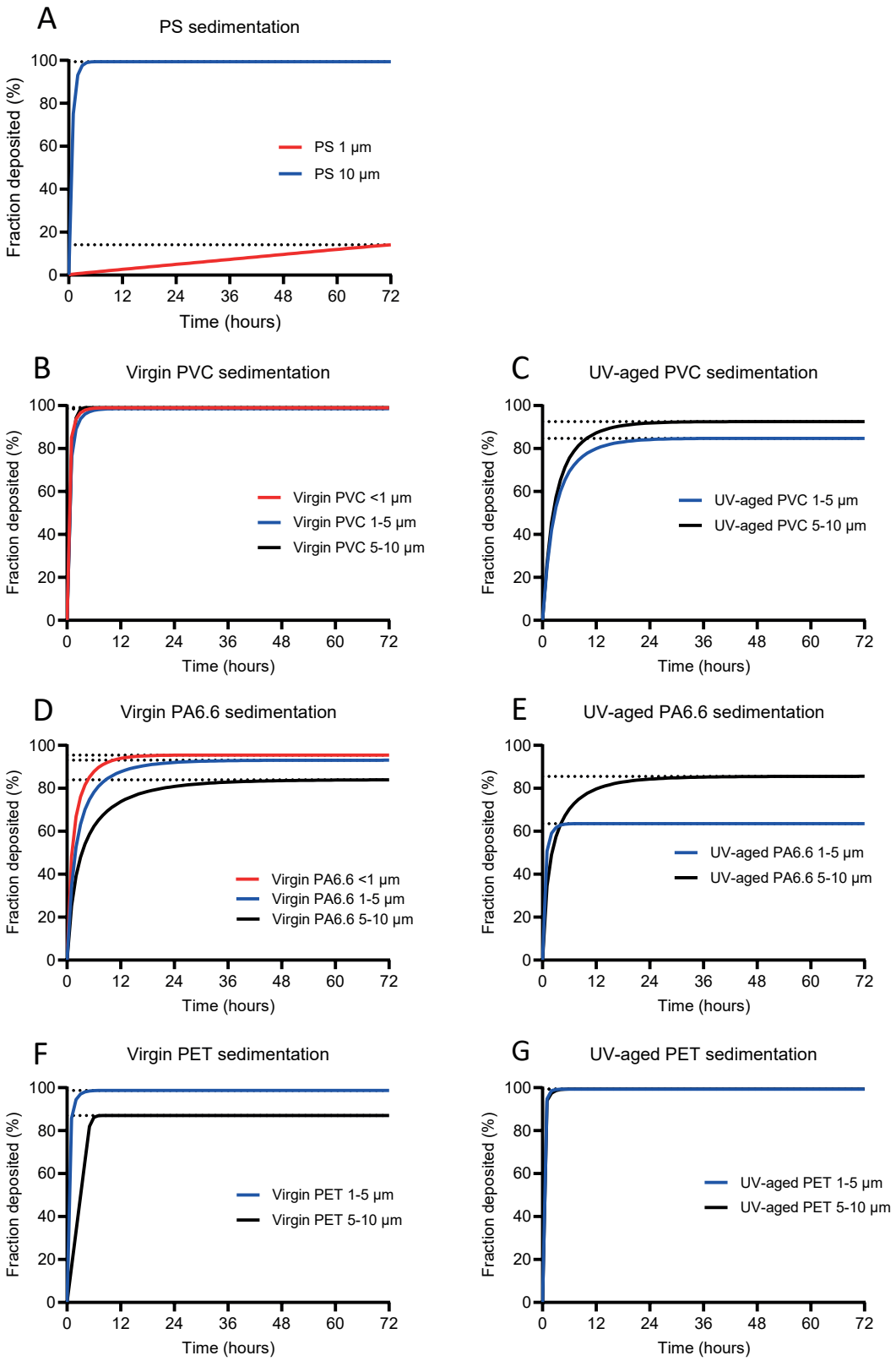
Supplementary Table 1

Particles	Dn in 1-propanol	Dv in 1-propanol	Dn in DMEM/F12 + 10% FCS	DV in DMEM/F12 + 10% FCS	Density polymers	Effective density in DMEM/F12 + 10% FCS
Size fraction	(µm)	(µm)	(µm)	(µm)	(g/cm^3)	(g/cm^3)
Spherical PS 1 µm	n/a	n/a	0.92	1.0	1.05	1.03
Spherical PS 10 µm	n/a	n/a	7.4	10.4	1.05	1.03
Virgin PVC <1 µm	0.21	5.72 ± 0.86	2.6	7.3	1.38	1.08
Virgin PVC 1-5 µm	1.46	4.65 ± 0.03	2.9	6.6	1.38	1.08
Virgin PVC 5-10 µm	4.17	10.6 ± 2.5	2.8	20.7	1.38	1.08
UV-aged PVC 1-5 µm	0.21	3.95	2.5	5.0	1.38	1.03
UV-aged PVC 5-10 µm	0.12	5.84	2.0	10.1	1.38	1.10
Virgin PA6.6 <1 µm	0.68	5.60	2.4	5.0	1.14	1.03
Virgin PA6.6 1-5 µm	1.42	3.98	2.5	62.8	1.14	1.03
Virgin PA6.6 5-10 µm	2.11	2.31	1.7	4.5	1.14	1.04
UV-aged PA6.6 1-5 µm	0.93	4.52	2.6	6.1	1.14	1.13
UV-aged PA6.6 5-10 µm	0.57	9.55	1.3	12.7	1.14	1.30
Virgin PET 1-5 µm	0.7	4.4	2.1	5.5	1.38	1.22
Virgin PET 5-10 µm	0.8	9.2	1.7	13.4	1.38	1.35
UV-aged PET 1-5 µm	0.6	3.4	1.8	4.5	1.38	1.57
UV-aged PET 5-10 µm	0.5	11. 2	2.0	13.5	1.38	1.25

Supplementary Table 1: Overview of median diameters, polymer density and effective density in medium. The number-based median diameter (D_n) and the volume-based diameter (D_v) of the size-fractions are measured in 1-propanol at a 100 µg/mL concentration and described previously by Gosselink et al (Gosselink et al., 2025). The polymer density and its effective density in DMEM/F12 + 10% FCS are derived from the data from the MOMENTUM WP3 deliverable report on ZENODO and measured by Zhang et al. (Zheng, 2025).



Supplementary Figure 1. Size distribution of PS, PVC, PA6.6 and PET in DMEM/F12 with 10% Fetal Calf Serum. The number- (dotted) and volume- (continuous) lines represent the size distributions of the different particles in medium. Monodisperse spherical 1 µm PS (red) and 10 µm PS particles (blue) (A). Polydisperse irregular-shaped virgin <1 µm PVC (red), 1-5 µm PVC (blue) and 5-10 µm PVC particles (black) (B). Polydisperse irregular-shaped UV-aged 1-5 µm PVC (blue) and 5-10 µm PVC particles (black) (C). Polydisperse irregular-shaped virgin <1 µm PA6.6 (red), 1-5 µm PA6.6 (blue) and 5-10 µm PA6.6 particles (black) (D). Polydisperse irregular-shaped UV-aged 1-5 µm PA6.6 (blue) and 5-10 µm PA6.6 particles (black) (E). Polydisperse irregular-shaped virgin 1-5 µm PET (blue) and 5-10 µm PET particles (black) (F). Polydisperse irregular-shaped UV-aged 1-5 µm PET (blue) and 5-10 µm PET particles (black) (G). Note, the size distribution of <1 µm appears larger as compared to the other the other size distributions. This is probably a result of agglomeration. Every size distribution is based on the average of three independent measurements from the same dispersion at 37 °C after 6-hour incubation.



Supplementary Figure 2. Sedimentation for PS, PVC and PA6.6 and PET in HEPES3+ with 10% Human Pooled Serum. Deposited fraction (%) for 100 µg/mL 1 µm and 10 µm PS particles (A), for virgin <1 µm, 1-5 µm and 5-10 µm PVC particles (B) and UV-aged 1-5 µm and 5-10 µm PVC particles (C). Deposited fraction for virgin <1 µm, 1-5 µm and 5-10 µm PA6.6 particles (D) and UV-aged 1-5 µm and 5-10 µm PA6.6 particles (E). Deposited fraction for virgin 1-5 µm and 5-10 µm PET particles (F) and UV-aged 1-5 µm and 5-10 µm PET particles (G). All deposited fractions are modelled for 72 hours. The dotted line represents the maximum reached deposited fraction for each polymer type and size fraction. The medium density of HEPES3+ supplemented with 10% HPS is considered to be 1.009632258 g/cm^3 and the medium viscosity 0.703536283 mPa.s at 37 °C. The volume column of the 96-well was considered 6.25 mm. The sub compartment was considered to be the height of a neutrophil, which is approximately 0.012 mm.

Supplementary Table 2

Particles Size fraction	(particles/gram)	Administered concentration 100 µg/mL (particles/mL)	Deposited fraction for 100 µg/ml (%)
Spherical PS 1 µm	1.82E+12	1.82E+08	14.1
Spherical PS 10 µm	1.82E+9	1.82E+05	99.4
Virgin PVC <1 µm	3.20E+12	3.20E+08	99
Virgin PVC 1-5 µm	6.80E+10	6.80E+06	98.5
Virgin PVC 5-10 µm	4.90E+09	4.90E+05	99
UV-aged PVC 1-5 µm	2.60E+12	2.60E+08	84.7
UV-aged PVC 5-10 µm	3.10E+13	3.10E+09	92.5
Virgin PA6.6 <1 µm	2.00E+11	2.00E+07	95.5
Virgin PA6.6 1-5 µm	1.40E+11	1.40E+07	93
Virgin PA6.6 5-10 µm	9.10E+10	9.10E+06	83.6
UV-aged PA6.6 1-5 µm	2.00E+11	2.00E+07	63.6
UV-aged PA6.6 5-10 µm	7.00E+10	7.00E+06	85.6
Virgin PET 1-5 µm	2.60E+11	2.60E+07	98.7
Virgin PET 5-10 µm	5.20E+10	5.20E+06	87
UV-aged PET 1-5 µm	6.40E+11	6.40E+07	99.3
UV-aged PET 5-10 µm	1.80E+11	1.80E+07	99.4

Supplementary Table 2: Overview of administered particle concentration and percentage of deposited fraction based on SLS and RiskGone. The deposited concentration calculated (particles/cm^2) with the output from the deposited fraction from the RiskGone output.

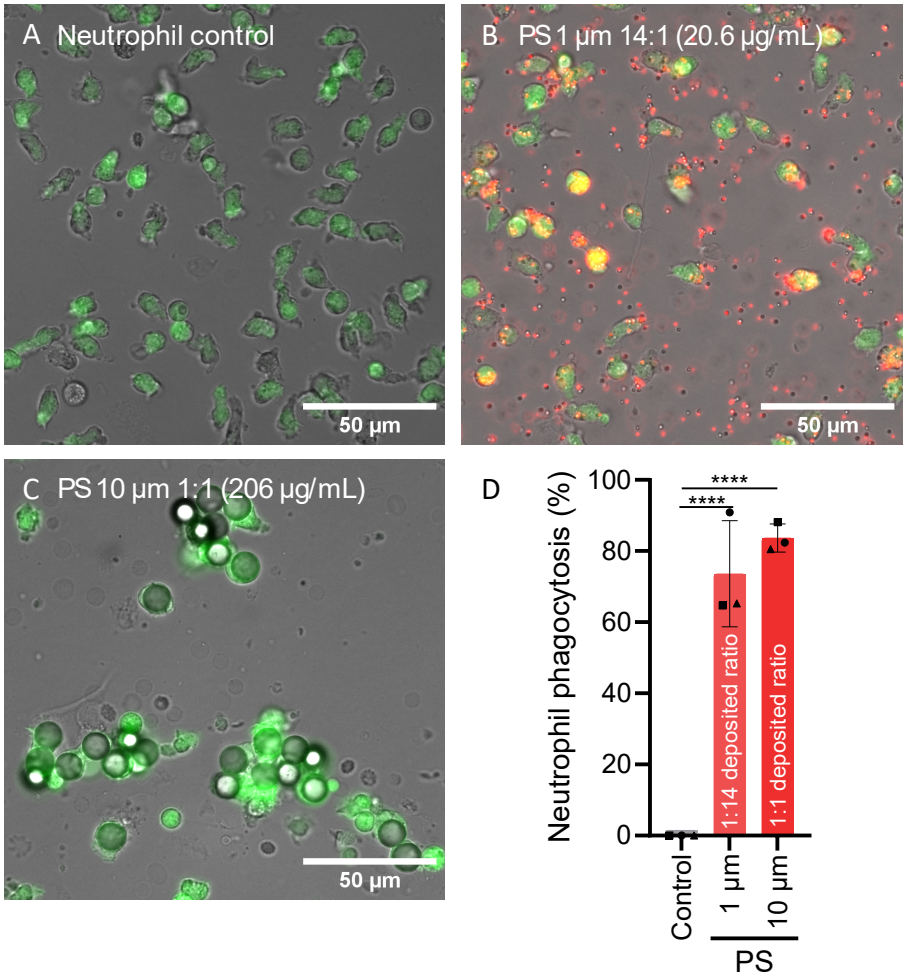
Supplementary Table 3A

Particles	Particle to cell ratio for 150000 cells/well			Particle to cell ratio for 75000 cells/well	
Size fraction	Cell survival assay			Phagocytosis and Cell death assay	
	1 µg/ml	10 µg/ml	100 µg/ml	1:1 (206 µg/mL)	1:100 (20.6 µg/mL)
Spherical PS 1 µm	0.34	3,4	34	n/a	14
Spherical PS 10 µm	0.0024	0.024	0.24	1	n/a

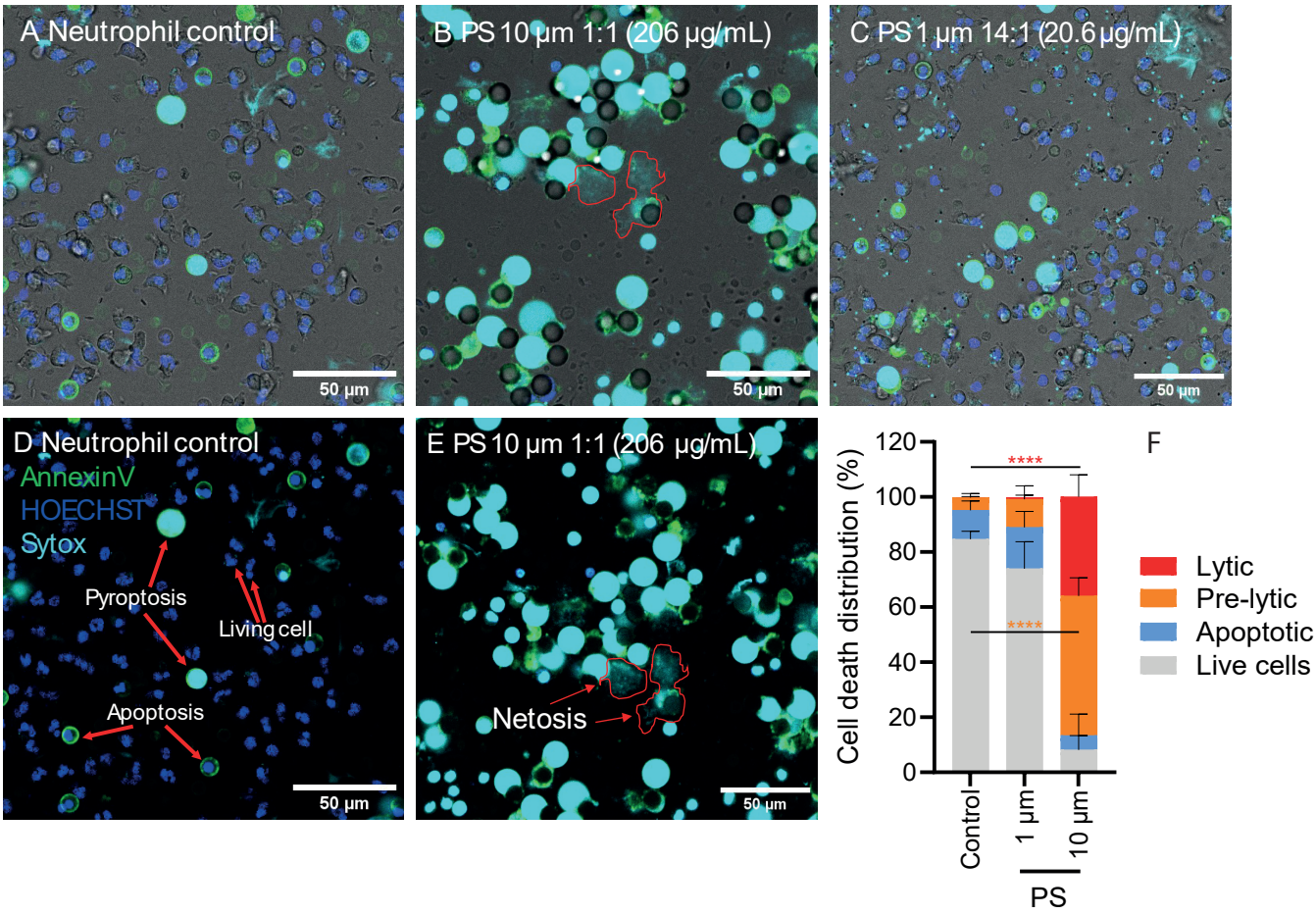
Supplementary Table 3B

Particles	Particle to cell ratio for 150000 cells/well			Particle to cell ratio for 75000 cells/well	
Size fraction	Cell survival assay			Phagocytosis Assay	Cell death assay
	1 µg/ml	10 µg/ml	100 µg/ml	20 µg/ml	50 µg/ml
Virgin PVC <1 µm	4.2	42	420	168	420
Virgin PVC 1-5 µm	0.089	0.89	8.9	4	8,9
Virgin PVC 5-10 µm	0.0065	0.065	0.65	0.26	0.65
UV-aged PVC 1-5 µm	2.9	29	290	117	290
UV-aged PVC 5-10 µm	38.2	382	3820	1530	3820
Virgin PA6.6 < 1 µm	0.25	2.54	25	10	25
Virgin PA6.6 1-5 µm	0.17	1.74	17	7	17
Virgin PA6.6 5-10 µm	0.10	1	10	4	10
UV-aged PA6.6 1-5 µm	0.17	1.70	17	7	17
UV-aged PA6.6 5-10 µm	0.080	0.80	8	3	8
Virgin PET 1-5 µm	0.34	3.4	34	14	34
Virgin PET 5-10 µm	0.060	0.60	6	2	6
UV-aged PET 1-5 µm	0.85	8.5	85	34	85
UV-aged PET 5-10 µm	0.24	2.4	24	10	24

Supplementary Table 3: Overview of the particle to cell ratios per number of cells/well. Particle numbers are based on the number of administered particles and on the sedimented particles modulated with the RiskGone output for the deposited dose and deposited fraction for each mass-based concentration for PS (A) and PVC, PA6.6 and PET (B). The particle to cell ratio is established for 150000 and 75000 cells seeded on 0.32 cm^2, which is the seeding surface area of one well of a 96-wells plate.



Supplementary Figure 3. Representative images of polystyrene phagocytosis by neutrophils. Neutrophils exposed to control (A). Neutrophils exposed to 1 µm polystyrene (PS) particles in a mass-based concentration of 20.6 µg/mL which represents a deposited particle to cell ratio of 14:1 (B). Neutrophils exposed to 10 µm PS particles in a mass-based concentration of 206 µg/mL which represents a deposited particle to cell ratio of 1:1 for (C). Cells are stained with CalceinAM (green), 1 µm PS particles contain red fluorescent protein (red) and 10 µm PS particles are depicted in brightfield (gray) after 18 hours. Scalebars represent 50 µm. Bar graph representing percentage of neutrophils that have phagocytosed a 1 µm or 10 µm PS particle (D). Statistical significance was using a one-way ANOVA followed by a Dunnett's multiple comparison test comparing particle-treated conditions to the neutrophil-only control. Data is represented as mean ± SD. Differences were considered significant at $p \leq 0.05$ (*), and highly significant at $p < 0.01$ (****). Each dot represents a biological replicate, N = 3.



Supplementary Figure 4. Overview to distinguish between live, apoptotic, pre-lytic or lytic death neutrophil. Representative bright-field images of live neutrophils with an irregular morphology with a distinct nucleus stained with HOECHST33342 in blue (A, C). Apoptotic neutrophils have a spherical-shaped morphology and stained with a AnnexinV-FITC membrane (green) and a Hoechst 33342 stained nucleus (blue) (D). Pre-lytic neutrophils have a swollen and spherical morphology with intact cellular membrane ring stained with AnnexinV-FITC but are filled with extranuclear DNA stained with SytoxBlue (cyan) (D). Lytic or NETotic neutrophils have no intact cellular membrane or nucleus but have extracellular DNA stained with SytoxBlue (E). Scalebars represent 50 µm. Cell death distribution for control neutrophils, neutrophils exposed to a deposited particle to cell ratio of 1:14 for 1 µm PS and neutrophils exposed to a particle to cell ratio of 1:1 for 10 µm PS after 18 hours (F). The bar graph represents the percentages of live cells (gray), apoptotic cells (blue), pre-lytic cells (orange) and NETotic cells (red). Data is visualized as mean ±SD and derived from three independent biological replicates. Statistical significance was determined for each type of cell death using a one-way ANOVA followed by a Dunnett's multiple comparison test comparing particle-treated conditions to the vehicle 1-propanol control. Differences were considered significant at $p \leq 0.05$ (*), and highly significant at $p < 0.01$ (****).