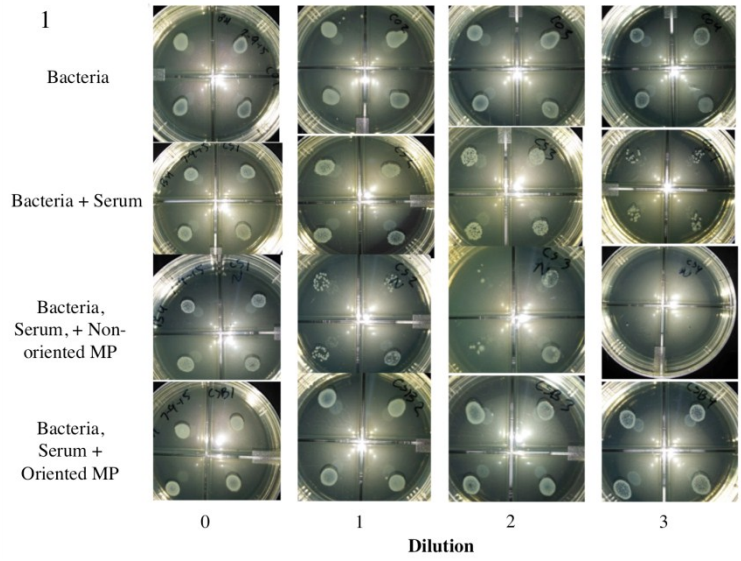
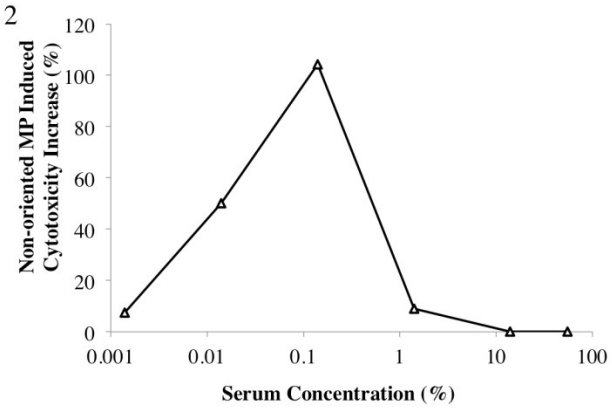
Electronic Supplementary Material (ESI) for Biomaterials Science.

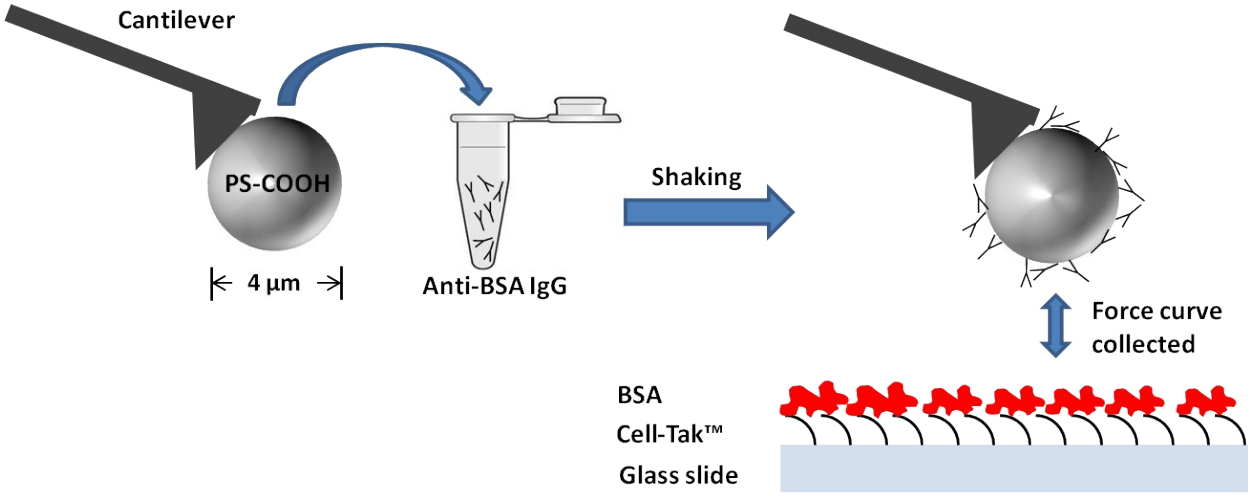
Supplemental Figures



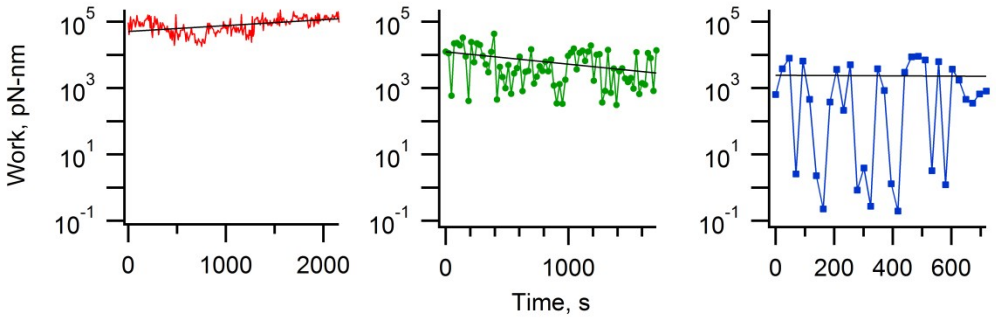
S1 Fig. Supporting pictorial data of CFU plates. Images of plates, depicting several dilutions for main conditions tested in experiments from Cytotoxicity studies (See Fig 3). Four experiments of each condition were spotted on each plate. It is clear that throughout all dilutions the trend of non-oriented particle cytotoxicity is consistent, as is the cytoprotective effect of oriented particles..



S2 Fig. Effect of serum concentration on perceivable difference in cytotoxicity. A plot of the percent increase in cytotoxicity relative to serum alone due to non-oriented Fc microparticles. Multiple serum conditions were tested from 0.0014% to 55%



S3 Fig. Schematic of atomic force microscopy (AFM) bound IgG orientation experiment. A single particle was glued to the cantilever and functionalized with anti-BSA IgG by passive adsorption. The functionalized cantilever was then used to probe binding to immobilized BSA. The process for the non-oriented particle is shown; for the oriented condition, the particles were first immersed in BSA, washed in PBS, and then incubated with anti-BSA IgG. The figure is not to scale.



S4 Fig. Work over time. The linear trend of the adhesive work over time for (A) non-oriented MP (32.8 pN-nm/second), (B) oriented MP (-5.6 pN-nm/second) and (C) MP with BSA block (-

0.22 pN-nm/second). Statistics are averages. The work did not decrease or increase significantly over time, indicating that the molecules were stable on their respective surfaces and did not desorb or denature during the course of the experiment.

S5 Fig. Antibody orientation affects adhesion forces. Histograms of maximum retraction forces measured by AFM for (A) non-oriented (1031±394 pN), (B) oriented (42.5±21.5 pN) and (C) oriented blocked with BSA (24.2±15.8 pN). Statistics are averages with standard deviations. The maximal adhesion strength upon retraction of the microparticle from the surface was measured for each force curve. For the non-oriented MP, multiple bond formation resulted in a force distribution that is non-Gaussian and very broad, displaying significantly more adhesion than the oriented and oriented-blocked MP. The adhesion force of the oriented MP was two orders of magnitude less than the non-oriented, and the oriented-blocked adhesion was, on average, half that of the oriented case. Gaussian fits of the two peaks apparent in the oriented-blocked histogram yield one force peak at 14.7±4.3 pN and a second at 36.8±1.6 pN, indicating single and double BSA-Ab bonds, respectively.

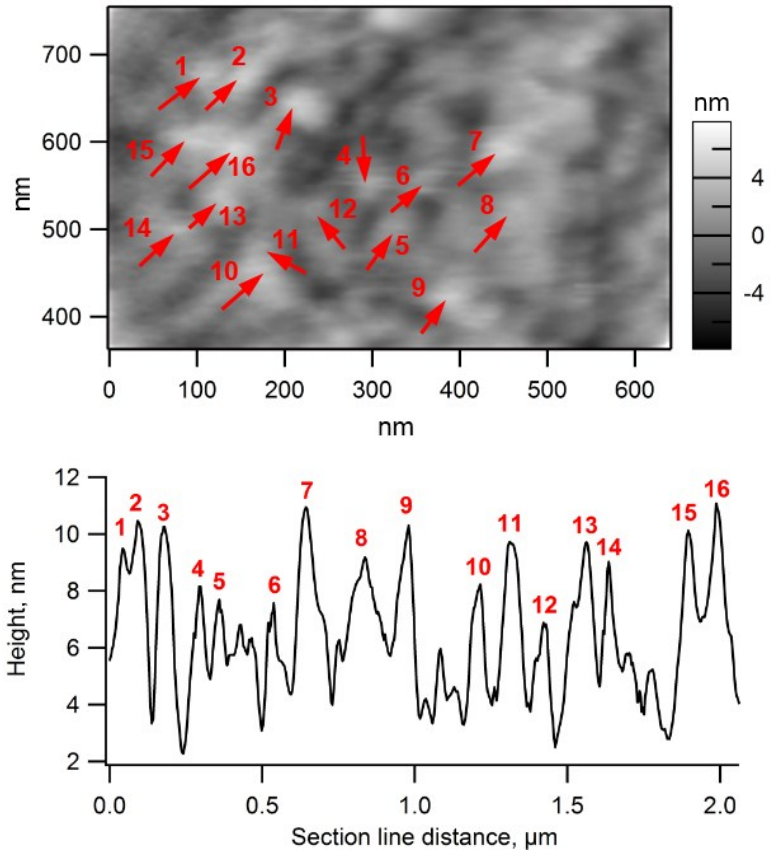


Fig S6. Peaks on oriented MP's indicate Fc regions. (A) Height image of oriented antibodies on a single MP with points of peak maxima shown with red arrows. (B) Section analysis trace of the height image with numbers to indicate their corresponding peaks in (A).