Figure captions

Figure 1. Morphology, composition analysis and magnetic properties of Ni NWs. (A) and (B) TEM images of a single NW, with the arrow showing the oxide layer; (C) and (D) EDX spectra of the NW core and surrounding layer, respectively. Insets show corresponding STEM image. (E) Magnetization curve of Ni NWs embedded in the alumina membrane. The applied magnetic field was parallel to the length of the NWs.

Figure 2. SEM characterization and aggregation of Ni NWs. (A) SEM images of the nanoporous alumina template before NW release and of Ni NWs after the release process. The NW diameter and length distribution are also shown. Data represent mean ± SD of over one hundred individually counted samples. Figure adapted from (Perez et al. 2013); (B) The left panel shows Ni NW aggregates characterization in McCoy's medium, as per confocal microscopy. Size distribution was obtained from over 1000 samples of NWs. The right panel shows the distribution of the number of instances single NWs or NW aggregates were observed using TEM images of HCT 116 cells incubated with Ni NWs.

Figure 3. Ni NWs cytotoxicity on HCT 116 cells. (A) MTT assay of HCT 116 cells incubated with Ni NWs. Figure adapted from (Perez et al. 2013); (B) MTT assay for Ni sulfate, with the concentrations equal in Ni mass to those tested for the NWs. NC = negative control. Data represent mean ± range, $n = 3$, $^{*}p < 0.01$; $^{a}p < 0.05$ vs. control.

Figure 4. Effects of Ni NWs on cell membrane permeability. (A) LDH leakage of HCT 116 incubated with Ni NWs; (B) TEER values of HCT 116 cells after incubation with Ni NWs. NC = negative control. Data represent mean ± range, $n = 3$, $^{*}p < 0.01$ vs. control; $^{a}p < 0.05$ vs. control.

Figure 5. Internalization of Ni NWs by HCT 116 cells. (A) 24 hours time-lapse microscopy study with pHrodo™ Red-labeled Ni NWs (200:1 NW to cell ratio). Cell nuclei are stained with Hoechst 33342. A single NW aggregate is pointed at by white arrows as it is broken apart by cells into smaller aggregates. (Scale bars: 100 μm); (B) Confocal microscopy Z-stack performed under the same staining conditions. The black arrow shows a non-fluorescent NW, while the white one denotes an internalized, fluorescent NW. (Scale bars: 10 μm); (C) and (D) TEM images of the localization of internalized Ni NWs after incubation for 24 and 72 hours, respectively. Black arrows mark NWs or NW aggregates; (E) MTT assay of Ni NWs with different endocytosis inhibitors. NC = negative control; Ny = nystatin; Ch = chlorpromazine; LatA = latrunculin A. Data represent mean ± range, $n = 3$, $^{*}p < 0.01$.

Figure 6. Apoptosis and necrosis induced by Ni NWs on HCT116 cells. Plots show the Alexa Fluor® 488 and PI fluorescence intensities of healthy (lower left quadrant), early apoptotic (lower right quadrant), late apoptotic/necrotic (upper right quadrant) and necrotic (upper left quadrant) cell populations under three different NW to cell ratios (100:1, 200:1 and 1000:1) for incubation times of 24, 48 and 72 hours. NC = negative

control cells. Numbers in quadrants indicate percentage of total cells and data represent mean ± SD, $n = 2$, $^{*}p < 0.01$; $^{a}p < 0.05$.

Figure 7. ICP analysis of Ni NWs dissolution. (A) Ni NWs at 200:1 NW to cell ratio. 1, 2 and 3 denote different conditions tested with and without NWs. Group 1: bare cell medium; group 2: cell medium from grown HCT 116 cells; group 3: lysed HCT 116 cell population in cell medium for quantification of Ni inside the cells; (B) Ni inside HCT 116 cells at different incubation times with Ni sulfate (equivalences to Ni NWs doses shown in brackets); (C) Mole atoms of Ni inside the HCT 116 cell population, as observed in (A) and (B); (D) Dissolution of Ni NWs in SBF solution. The graph shows the percentage of the total mass of Ni NWs that was dissolved in SBF pH 7.4 and pH 4.8, as well as a control SBF solution without NWs. Data represent mean ± range, $n = 3$, $^{*}p < 0.01$.