Nanoparticle use in biomedicine: the need for light to shine the unpaved path

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The field of nanomedicine is up and coming, where the wide variety in different types of nanomaterials, with their specific properties, are being explored in a wide plethora of biomedical applications, including cancer diagnosis and therapy. To further develop this relatively novel field, more insights are needed on how nanomaterials, originally developed for industrial use, behave in a physiologically relevant environment.[1]

Typical biochemical toxicity assays were soon shown to be prone to interference by the nanomaterials, which led to the need for novel assays that can be performed at high throughput rates and high reproducibility levels to ensure a proper assessment of bio-nano interactions. Here, I will discuss some aspects of the high content imaging approach used for analyzing the toxicity of the nanomaterials, with respect to the cellular toxicity levels and underlying mechanisms, in particular focusing on multiparametric aspects that cannot easily be studied using common biochemical assays (Figure 1).[2,3,4]

Additionally, some initial work on the *in vivo* assessment of the therapeutic efficacy of the nanomaterials is presented, where optical methods are used to track delivery of nanomaterials, delivery of therapeutics, or how to determine required nanomaterial doses in function of tumor metabolism.[5,6]

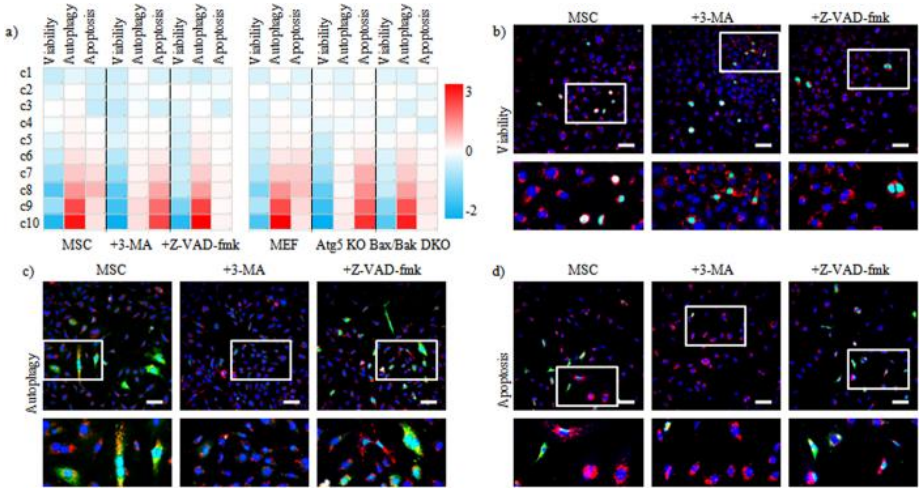

***Figure 1**: (a) Heat maps of high-content imaging-based data for MSCs, MSCs treated with 3-MA or Z-VAD-fmk or MEFs, MEF Atg5 KO or MEF Bax/Bak DKO exposed to QDots at 10 nM (MSC cells) and 12.5 nM (MEF cells), respectively. Cells were analyzed for; cell viability, autophagy and apoptosis, where after analysis, the cellular effects were grouped based on the different categories for cellular QDot concentrations. (b–d) Representative InCell high-content images; scale bars = 100 μm, the area in the white rectangle is depicted in a magnified view below the original image.*[3]

References

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