

Lecture 11: Assessing nanotoxicity at the single cell level

11.1 Need for single cell measures of nanotoxicity

11.1.1 There is more than one way for a cell to die...

11.1.2 "Necrosis" vs. "Apoptosis"

11.1.3 There are other forms of "toxicity"

11.1.4 Some other challenges in measuring toxicity of nanomaterials

11.2 Necrosis vs. Apoptosis mechanisms

11.2.1 Necrosis is unplanned "cell injury"

11.2.2 Apoptosis is planned "programmed cell death"

11.2.3 Why it is important to distinguish between necrosis and apoptosis?

11.3 Single-cell assays for necrosis and apoptosis

11.3.1 Dye exclusion assays for necrosis

11.3.2 TUNEL assays for late apoptosis

11.3.3 Annexin V assays for early apoptosis

11.3.4 COMET assays for DNA damage and repair

11.3.5 Light scatter assays

11.3.6 Dihydroethidium assays for oxidative stress

11.4 Nanotoxicity in vivo – some additional challenges

11.4.1 Single-cell nanotoxicity, plus biodistribution measuring challenges....

11.4.2 Accumulations and agglomerations of nanoparticles can change toxicity locally to tissues and organs

11.4.3 Filtration issues of nanoparticles – size matters – toxicity to kidney, liver and lung

11.4.4 Functional sensitivity of heart and brain to nanotoxicity largely unknown

References

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