

Quantifying nanoparticle uptake into and distribution in human cells

Christoffer Aberg

RU Groningen

Drug delivery using nano-sized carriers has promised to revolutionize medicine, but has, as yet, met with few clinical successes. Within the field, there is a growing awareness that we may need to understand the fundamental principles of how nano-sized objects interact with tissue, biological barriers and cells before we can design better nanomedicines. Key to such an endeavour is the proper quantification of how many nanoparticles enter cells and where they go once inside. We discuss various approaches, paying particular attention to novel properties of the nanoscale that need to be taken into account. As an example, we present measurements of short and long-term cellular accumulation, finding in the latter case that the cell-division cycle needs to be taken into account in order to understand the kinetics. In particular, we present a methodology for resolving the question of whether nano-sized objects which have entered cells ever exit again, a key question for understanding their bioaccumulation.