NEW PHYSICAL AND CHEMICAL APPROACHES FOR THE CYTOSOLIC DELIVERY OF BIO-THERAPEUTICS AND NANOPARTICLES INTO CELLS

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Delivery of bio-therapeutics and nanomaterials into living cells is an important step not only for cell studies but also for therapy and bio-imaging. Clear examples are the intracellular delivery of various classes of nucleic acids (siRNA, µRNA, mRNA, pDNA), peptides and proteins for therapy purposes. As another example, all types of (inorganic/organic) nanoparticles are under investigation as intracellular labels for imaging purposes. Meanwhile it generally accepted that after uptake by cells, nanomaterials typically end up in endo-lysosomal vesicles in which they remain entrapped while they should escape from such compartments and arrive in the cytosolic fluids of the cells. In recent years our team undertook major efforts to understand the biophysics which play a role in (a lack of) escape of nanomaterials from endo-lysosomal vesicles. Vere recently we also discovered new chemical strategies (so named ‘escape adjuvants’) (1) which seems promising to ‘liberate’ nucleic acids (like siRNA) from endo-lysosomal vesicles into the cytosol. Furthermore we explored physical methods (either light (2,3) or ultrasound (4) driven) which directly deliver bio-therapeutics into the cytosol, thereby bypassing the endo-lysosomal routes. This lecture will explain our recent findings in this area, as reported in a serious of recently published papers (1-4). Both pharmaceutical, biological and engineering aspects of our work will be highlighted in the lecture.

References

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