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Pharmacokinetics and Experimental Therapeutic Study of DNA and Other Biomolecules Using Lasers: Advantages and Applications

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Editorial

In this editorial, simulation results on the heating process of Cadmium Oxide (CdO) nanoparticles after irradiations by ultra–short laser pulses zeptosecond, attosecond, femtosecond, picosecond and nanosecond are presented. We use a model utilizing the uniform heating approximation and the small size of Cadmium Oxide (CdO) nanoparticles in comparison to the wavelength of laser irradiations confirm that this model is appropriate approximation for Cadmium Oxide (CdO) nanoparticles heating in the zeptosecond, attosecond, femtosecond, picosecond and nanosecond regimes [1-9]. It shows that during the laser pulse duration the transfer of heat from the Cadmium Oxide (CdO) nanoparticles into the surrounding media is slight but when the laser pulse has degraded, the transfer of heat from the particle to the surrounding medium becomes increasingly important. In nanosecond regime, because of longer pulse duration, this heat transfer is higher than others and temperature of particle rapidly decreases. The effects of the different pharmacokinetics, experimental therapeutic, biomedical, bioanalytical, clinical and biological surrounding biomedia blood, human prostate, tumor and fat are investigated. Fat possesses low thermal characteristics and we observed higher heating of the particles at the same energy level and duration of the laser pulse due to the relatively low thermal conductivity of fat as compared to the other biomedia. This editorial will compare thermal calculations for 60 (nm) Cadmium Oxide (CdO) nanoparticles, which is heated and cooled in water at different heat transfer rates for zeptosecond, attosecond, femtosecond, picosecond and nanosecond regimes.

The temperature dynamics of the particle is sensitive to the temperature dependence of the heat lost from the surface of the Cadmium Oxide (CdO) nanoparticles into the surrounding medium. In the picosecond regime, pulse duration is very small and medium with high thermophysical characteristics cannot change the temperature greatly but in the zeptosecond, attosecond and femtosecond regimes, medium with low thermal conductivity can alter the temperature of Cadmium Oxide (CdO) nanoparticles very much.

On the other hand, Free Electron Lasers (FELs) are lasers that use an electron beam from an accelerator to produce widely tunable, high power, ultrafast pulses of coherent irradiations. Free Electron Lasers (FELs) are today important sources of Infrared and Far Infrared (FIR) irradiations around the world. Also, in this editorial, we discuss about advantages and applications of Free Electron Lasers (FELs) at the pharmacokinetics, experimental therapeutic, biomedicine, bioanalysis and biology [10-18].

A coherent and high brightness light source that can operate from the Far Infrared (FIR) to X-Ray (XR) wavelengths and can provide zeptosecond, attosecond, femtosecond, picosecond and nanosecond pulses at all these wavelengths appears to be the embodiment of a combined wish–list of a whole generation of biochemists and biophysicists. Light at the shorter wavelengths promises to elucidate the structures of biomolecules such as DNA, nucleic acids, amino acids and proteins. It should help structural genomics leapfrog the yawning gap between what we know of the human nucleic acids and DNA, thanks to the human nucleic acids and DNA project and what we know about the amino acids and proteins structures that these genes' codes. Light at longer wavelengths promises to improve our even more abysmal knowledge of the dynamics of these structures. Light in the Far Infrared (FIR) region probes the realm of the collective motion of the whole or of substantial domains of amino acids and proteins. All pharmacokinetics, experimental therapeutic, biomedicine, bioanalysis and biology finally stems from the dynamic interaction of the structures that the cells' DNA makes and any machine that boasts of the power to elucidate both structure and dynamics of biomolecules such as DNA, nucleic acids, amino acids and proteins will surely grab the attention of the whole of the pharmacokinetics, experimental therapeutic, biomedical, bioanalytical, clinical and biological communities. In addition, we have already described that a Free Electron Laser (FEL), in principal, can be such an ideal light source. It should be noted that in this editorial, we just discussed about some of the promises that Free Electron Lasers (FELs) and specially Far Infrared Free Electron Lasers (FIR FELs) hold for pharmacokinetics, experimental therapeutic, biomedicine, bioanalysis and biology.

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