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**Nanoparticle-assisted ultrasound: a special focus on sonodynamic therapy against cancer**

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**Abstract**

At present, ultrasound radiation is broadly employed in medicine for both diagnostic and therapeutic purposes at various frequencies and intensities. In this review article, we focus on therapeutically-active nanoparticles (NPs) when stimulated by ultrasound. We first introduce the different ultrasound-based therapies with special attention to the techniques involved in oncological field, then we summarize the different NPs used, ranging from soft materials, like liposomes or micro/nano-bubbles, to metal and metal oxide NPs. We therefore focus on the sonodynamic therapy and on the possible working mechanisms under debate of NPs-assisted sonodynamic treatments. We support the idea that various, complex and synergistic physical-chemical processes take place during acoustic cavitation and NP activation. Different mechanisms are therefore responsible for the final cancer cell death and strongly depends on not only the type and structure of NPs or nanocarriers, but also on the way they interact with the ultrasonic pressure waves. We conclude with a brief overview of the clinical applications of the various ultrasound therapies and the related

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