Gold nanoprism–nanorod face off:
comparing the heating efficiency, cellular internalization and thermoablation capacity

nanoimmunotech
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ADAPTED FROM GABRIEL ALFRANCA, ET AL. NANOMEDICINE 2016, 11

This work compares the synthesis, heating capability, cellular internalization and thermoablation capacity of two different types of anisotropic gold nanoparticles: gold nanorods (NRs) and nanoprisms (NPrs).

SITUATION

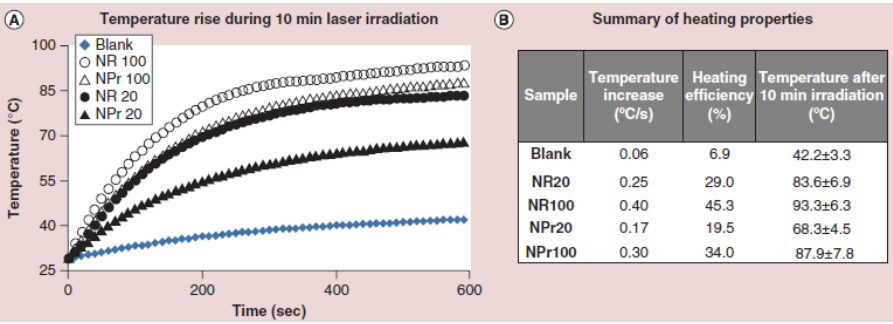
The photothermal treatment of solid tumors by thermoablation has reached the stage of clinical trials. The ability of nanomaterials to convert light energy into heat, the photothermal effect, is a characteristic and versatile property applicable to many biomedical applications including photothermal therapy (PTT) among others.

APPROACH

Gold nanorods (NRs) and nanoprisms (NPrs) possess surface plasmon resonance absorption bands in the near-IR, and produce heat upon irradiation with a continuous near-IR laser (1064 nm). The cellular internalization, location and toxicity of these PEGstabilized NPrs and NRs were assessed in the Vero cell line, and their ability to induce cell death upon laser irradiation was then evaluated and compared.

RESULTS

Although both nanoparticles are highly efficient photothermal converters, NRs possessed a more efficient heating capability (Figure 1), yet the *in vitro* thermoablation studies clearly demonstrated that NPrs were more effective at inducing cell death through photothermal ablation due to their greater cellular internalization (Figure 2).



Sample	Temperature increase (°C/s)	Heating efficiency (%)	Temperature after 10 min irradiation (°C)
Blank	0.06	6.9	42.2±3.3
NR20	0.25	29.0	83.6±6.9
NR100	0.40	45.3	93.3±6.3
NPr20	0.17	19.5	68.3±4.5
NPr100	0.30	34.0	87.9±7.8

Figure 1_ Characterization of the heating capacity.

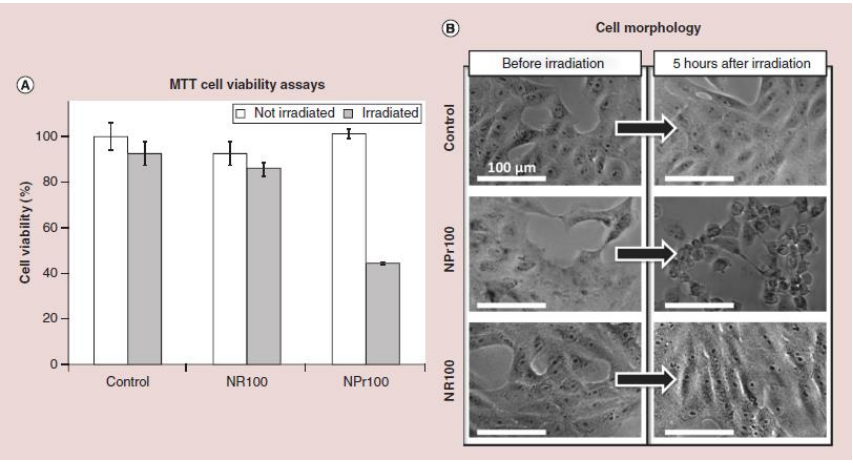


Figure 2_ Cell viability and morphology following thermoablation studies

Gold nanoprisms could be appropriate candidates for *in vitro* cellular thermoablation due to their efficient internalization and heating capacity