Investigating the Design of Nanoparticles to Target Difficult-to-Reach Tumors

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Certain cancers (metastatic breast cancer, invasive glioma) are deadly because of their inability to be treated using existing methods. Nanoparticles, can be engineered to access these areas. In previous studies, iron oxide nanochains have shown significant therapeutic effect compared to spherical nanoparticles. Although literature shows gold and iron oxide function similarly, gold is easier to synthesize in mass quantities and can be tagged with radioactivity. Further investigating the design (shape, size, flexibility) of the particles, will give insight into how these attributes can govern the efficiency of these drug-carrying particles to reach these tumor sites. The other particle, liposomes (50-100 nm) coated in poly ethylene glycol were targeted with P-selectin, RGD ligands, and a P-selectin RGD combination to target the alpha 5 and beta 3 integrins of a tumor. An immunotherapeutic drug was carried by the liposomes and directly linked to the decreasing of the breast tumor size. All particles shapes were tested in three in vivo mouse models of breast cancer and glioma (n greater than or equal to 3), performed by mentoring researchers. The particles were analyzed and imaged for size and shape using a transmission electron microscopy (TEM). The amount of gold and lipids per organ was measured after digesting the organs, liver, spleen, kidneys, lungs, brain, tumor, using inductively-coupled plasma optical emission spectrometry. Data from in vivo mouse models using liposomes are still being collected. In conclusion, ongoing studies suggest that targeting strategies can be custom-engineered to reach difficult-to-target tumor sites, and future studies will focus on the transportation mechanisms of liposome immunotherapeutic drug targeting.

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Third Award of $1,000