Imaging and Treatment of Tumors with Water-Soluble Near Infrared Cyanine Dyes

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Technology description

Technical Summary

Morbidity and mortality of cancer patients improve with early detection of tumors and metastases, however imaging techniques developed for this purpose are still largely inadequate. Existing imaging probes are often ineffective due to poor specificity and retention at tumor lesions, and shallow tissue penetration. Additional issues such as interference from resident tissues such as skin, hair, liver and kidney also make imaging tumors and metastases a difficult task. To overcome these obstacles, Emory researchers have developed novel cyanine dyes for use as imaging agents. These near-infrared (NIR) dyes are small (>1kDa), easy to administer, and rapidly enter the cell. They have high molar extinction coefficients and relatively large stokes' shifts, making their fluorescent emission profile (800nm) detectable by commercially available imaging systems. Optical properties such as high molar absorbance and high quantum yields, as well as greater light penetration at the NIR excitation wavelength offer improved imaging contrast and decrease the importance of Rayleigh scattering. With increasing time, cyanine dyes are preferentially absorbed and retained by tumor cells but cleared from normal tissues such as liver and kidney, thus reducing background interference. Beyond imaging, these cyanine dyes also offer therapeutic potential. Treatment of human prostate cancer cells with a prototype cyanine dyein vitroresulted in cell death, and injection of this same compound reduced the size of human prostate tumors in a xenograft small animal model.

Application area

Near-infrared cyanine dyes for high contrast imaging and therapeutic intervention of tumors and metastases.

Advantages

NIR dyes offer improved optical properties, increased preferential targeting to tumors, and reduced interference and background over existing probes.
Intrinsic cytoxicity and specificity for tumors impart therapeutic potential to NIR dyes.

Institution

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