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Photodynamic Therapy and Hyperthermia Using Nanometric Magnetic Particles: Biological effect and Thermal Property

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The magnetic particles with nano-size can be delivered into tumor cells and discharged out of living body effectively. Therefore, the effects for diagnosis and treatment of tumor are elevated. In this study, hyperthermia was performed to improve the treatment ratio simultaneously with photodynamic therapy (PDT) using nanometric magnetic particles. The reaction of magnetic dipole-dipole was minimized by applying decanoic acid as 1st surfactant, and alginic acid was applied as 2nd surfactant, respectively. The adsorption efficiencies of hematoporphyrine and 5-aminolevulinic acid were 2.0% and 12.5% for magnetic particles adsorbed with each photosensitizer, respectively. And in vivo with human cancer cell was performed to investigate the PDT efficiency according to coating efficiencies. The cell destruction in the case of 5-aminolevulinic acid increased with increased light doses proportionally whereas hematoporphyrin did not show the remarkable cell destruction.

Also, The heat generation yields per gram of each photosensitizer-adsorbed and bare magnetic particles were investigated with solution calorimeter by changing the temperature from 36.5℃ to 42℃. The bare magnetic particles showed about 4kcal/g lower generation yield per gram than photosensitizer- adsorbed magnetic particles.