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Gold nanoparticles for non-invasive in vivo cell tracking with CT imaging

Rinat Meir
Bar-Ilan University, Israel

Cell-based therapy is the transplantation of living cells for the treatment of diseases and injuries. Such therapy offers a promising solution for the treatment of various pathologies that conventional medicine cannot cure effectively, thus encouraging future medical breakthroughs. For instance, cancer-fighting T cells may be injected in the course of cancer immunotherapy, and stem cells may treat neurodegenerative diseases, heart disease, muscular dystrophy and diabetes. A major obstacle in the advancement and implementation of cell therapy is the challenge of non-invasively tracking transplanted cells in the body. *In vivo* cell tracking could elucidate essential knowledge regarding mechanisms underlying the success or failure of therapy. An optimal solution for the challenge of cell tracking does not yet exist hence there is need for an accurate imaging technique. We developed a novel methodology for longitudinal and quantitative *in vivo* cell tracking, based on the combination of CT as an imaging modality and gold nanoparticles as labeling agents. We were able to show that uniting the superior visualization abilities of classical CT with state-of-the-art nanotechnology is the key for high-resolution cell tracking. In the future, this technology has the potential to be applied clinically and to serve as an early warning system for patients after cell transplantation.

meirinat@gmail.com

Synthesis and characterization of epoxy containing hydrogel membrane adsorption system and application to reducing of pollution in chrome tanning and dyeing process

Sinan Akgöl[1], **S Meriç Açıkel**[2], **R Hilal Şenay**[1] and **Ahmet Aslan**[1]
[1]Ege Universitry, Turkey
[2]Istanbul University, Turkey

Trivalent chromium is an important pollutant by a variety of industrial wastewaters like textile, leather tanning and metal industries. Especially the releasing non bounding Cr III ions in water can be reduced to harmful Cr VI ions by the environmental factors (UV, temperature, etc.). So, day by day trivalent chromium removal from waters gains importance. In advance processes such as ozonation, electrochemical and ultrasonic techniques, membrane filtration, photo-catalysis and adsorption have been used for the heavy metal removal. Nowadays, adsorption techniques by polymers have been popular studies because of simplicity of design, ease of usability and effectiveness. However hydrogel membrane systems, which are a separation technique, can adsorb various chemicals with their functional groups and can retain aqueous solutions of up to hundreds of times their own weight. In this presented work, p(HEMA-GMA) poly (hydroxyl-ethyl methacrylate-co-glycidyl methacrylate) hydrogel membrane was produced by UV photo polymerization and the synthesized membrane was coupled with iminodiacetic acid (IDA) in order to chelate the Cr III ions at different concentrations of aqueous Cr III solution (1300-13000 ppm) at pH 4.3 (adjusted with HCl and NaOH), which was the optimum pH for Cr III chelate formation, at 25oC and the Cr III adsorption capacity of p(HEMA-GMA)-IDA membrane was determined using a UV/Vis spectrophotometer at a wavelength of 601 nm. Also characterization of p (HEMA-GMA)-IDA membrane was researched by SEM imagines, ATR-FTIR, Langmuir and Freundlich adsorption isotherms. Finally the results showed that p (HEMA-GMA)-IDA membranes was calculated as 361.21 mg/g (6.95 mmol/g) Cr III ions. So p (HEMA-GMA)- IDA membrane can effectively be used for the removal of trivalent chromium from aqueous solutions. Then p (HEMA-GMA)-IDA-Cr(III) membrane was used for removing acid dye in the dying process effluents in laboratory conditions.

sinanakgol@gmail.com