Applications and advantages of gold nanoparticles as X-ray contrast age

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Abstract

X-ray medical imaging is one of the most important imaging techniques because its low cost and reachable technique. But it has poor ability of depict soft tissues and small details between soft tissues at the borders of interference. This limitation was overcome by using iodine-based contrast agent but this chemical compound has limitations for use due to its toxicity and side effects. Ten years ago, a new variant contrast agent of medical X-ray imaging was discovered, developed and understudy to date. The new variance factor is gold nanoparticles, which may overcome these limitations because of its excellent properties, where the biological distribution of these Nanoparticles is higher than iodine compounds, interference between bones and soft tissue is more apparent and these nanoparticles stay longer at the targeted site which allows for a longer imaging time. All of the above factors enhance the X-ray diagnostic ability. This study consists of the synthesis of gold nanoparticles, animal preparation (which includes a selection of animal type, housing, preparing the tumor and tumor implantation), intravenous administration of gold nanoparticles to tumor implanted mice then X-ray imaging was taken by conventional X-ray unit. The resulted X-ray images demonstrated that gold nanoparticles were attractive to move towards tumor site through the general circulation and spent more time at the tumor site (inverse the iodine contrast agent) which allows for a longer time of imaging, lower levels of toxicity and side effects. All of the mentioned factors leads to enhancement of X-ray diagnostic (i.e. obtained X-ray images contain the site of abnormality, two dimensions abnormality map, extra details of bone-soft tissue interference and high contrast level).

Recent Publications

1. E Boisselier and D Astruc (2009) Gold nanoparticles in nanomedicine: preparations, imaging, diagnostics, therapies and toxicity. Chemical Society Reviews. 38(6):1759-1782.

2. Na Li, P. Zhao, D. Astruc, M. R. Ivanov, H. X, J. Pk and M. A. Al-Sayed, “Gold nanoparticles for biology and medicine,” Small, vol. 1, no. 1, pp. 3280–3294, 2010.
3. S Ahn, S Y Jung and S J Lee (2013) Gold nanoparticle contrast agents in

advanced X-ray imaging technologies. Molecules. 18(5):5858-5890.

4. Cole L E et al. (2015) Gold nanoparticles as contrast agents in X-ray imaging and computed tomography. Chemical Reviews. 10(2):321-341.

5. J F Hainfeld et al. (2006) Gold nanoparticles: a new X-ray contrast agent. British Journal of Radiology. 79(939):248-253.

Biography

Mohammed H. Alwan has completed his Bachelor degree from Baghdad University/ Iraq in 2004 then studied for M.Sc degree in Al-Nahrain University/ Iraq and graduated at2018. He spent ten years serving as Biomedical Engineer at the Ministry of Health institutes/ Iraq started at 2005 in Al-Karamaa general Hospital and in Ibn-Al-Bitar Center for Cardiac and Vascular Diseases and Al-Sadr General Hospital then at 2015 in the Middle Euphrates center for oncology at Al-Najaf health directorate.

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