Advanced Cancer Treatment Using Alpha Particles

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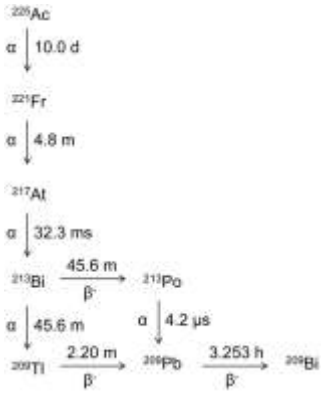
***Abstract*—In order to more effectively fight cancer, the use of alpha particles has been developed. Elements emitting alpha particles are harder to control, thus more difficult to use although much more effective in killing the cancerous cells. Using nanotechnology researchers have been able to develop methods to control alpha particles in the body, thus limiting the damage done to surrounding cells and allowing them to be used.**

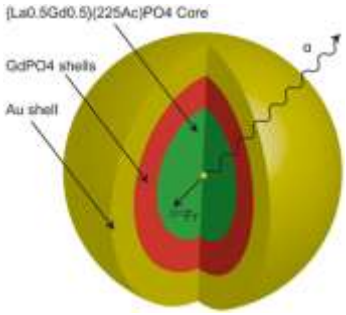
I. Introduction

The use of alpha particles in treating cancer was limited before some current advancements in nanotechnology, but due to research done by teams at the university of Missouri, and Rice university, alpha particles can now be controlled enough to be able to be used in fighting cancerous cells. Alpha particles due to their high energy are able to kill a cancerous cell with a single alpha particle, whereas the current beta particle emission technologies require thousands of beta particles to bombard a single cancerous cell to kill it. Beta particles are easier to control due to their lower energy state, thus they are used in current cancer treatments, and because of their smaller size, they are able to penetrate many cellular layers. As alpha particles are much larger than the beta particles, they cannot penetrate as far, limiting the damage done to surrounding non cancerous cells.

II. Methods

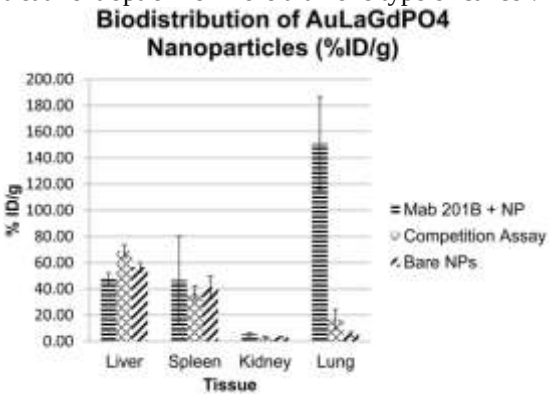


Using an actinium core within the gold coated nanoparticle, the core is able to undergo four separate alpha particle emissions as the four decay chain daughters also are able to undergo alpha decay as well. In the gold coated experiment a gold shell is employed over the nanoparticle in order to allow the antibodies to attach to it and direct the particle to the cancerous cell.



III. Results

When the antibody targeting cancerous lung tissue was applied to the gold coating of the nano particle, there was a significant increase in the concentration of the nanoparticles in the lung tissue, and as with all intra veinous, there is a slight build up in other organs with similar tissue designs as the antibodies attach, also showing that unlike former alpha particle treatments for bone cancer, that this can be used as a treatment option for more than one type of cancer.



IV. Discussion

Alpha particles are able to more effectively destroy cancerous cells and are able to do so without as much damage to surrounding tissues. These developments will be able to provide cancer patients with a treatment option that allows provides less damage to the rest of their bodies, thus also increasing chances of survival.

References

[1] McLaughlin MF, Woodward J, Boll RA, Wall JS, Rondinone AJ, et al. (2013) Gold Coated Lanthanide Phosphate Nanoparticles for Targeted Alpha Generator Radiotherapy. PLoS ONE 8(1): e54531. doi:10.1371/journal.pone.0054531

[2] Rice University. "New Cancer Weapon: Nuclear Nanocapsules." ScienceDaily, 28 Aug. 2007. Web. 23 Feb. 2013.

[3] University of Missouri-Columbia. "Gold nanoparticle can transport powerful radioactive particles directly to tumors for treatment."ScienceDaily, 4 Feb. 2013. Web. 23 Feb. 2013