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RESEARCH ARTICLE

AN ARTICLE REVIEW ON TUMOR-SPECIFIC AUTOMATED DRUG DELIVERY SYSTEM

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Abstract

In this article, "targeted and controlled anticancer drug delivery and release with magneto-electric nanoparticles," published in 2016, rodzinski et al., explain how magneto-electric nanoparticles abbreviated as (mens) can be used to monitor the delivery of drugs and their release into cancer cells. They go further to explain how they use this automated drug delivery system to eradicate cancerous tumor cells.

Introduction:-

According to the authors, the main physics behind the automated drug delivery system is electric field interactions that take place between the drug being delivered and mens. The main function of the mens is to distinguish the cancerous cells from the health cells using the membrane's electric properties. The writers state that the cancerous cells contain a smaller threshold field necessary for the induction of electroporation.

The authors conducted extensive research that is reliable and dependable. They used both in vivo and in vitro studies with mice containing skov-3 xenografts and the paclitaxel (ptx) drug. The study showed that the researchers were able to attach the drug to the mens using surface functionalization to avoid it from being released prematurely. The study further found out that the best way of delivering the drug-loaded mens into the specific cancerous cells was by applying a direct current field of approximately ~100 oe. According to the study, once the drug-loaded mens were in the cancerous cells, it was necessary to apply an alternating current field of approximately ~50 oe, 100 hz to release the drug from the mens whenever required.

In the research, the methods of spectrophotometry and the scanning probe microscopy were used to measure the cell lysate content. The mens loaded with the ptx drug and their control ferromagnetic were administrated intravenously. According to the results obtained from this research, the mice that were treated with mens loaded with ptx drug (15/200 µg) were the only ones cured in the field within three months. The results were confirmed using infrared imaging.

The world today has been faced with numerous cases of cancer. A majority of these cancer patients lose their lives daily in various hospitals. Despite having some cancer remedies, no cure has been found yet. One of the main challenges to these tumors is to come up with the right technology that will assist in the delivery of drugs to these cancer cells. The main idea behind the research was to come up with a solution to the problem of finding a reliable drug delivery system that is automated and drug-specific. The authors of this article argue that even though the human circulatory system is sufficient and competent in the delivery of drugs to every body cell, it has a limitation as far as tumor cells are concerned. This argument is justified because the circulatory system of human beings cannot deliver the drug specifically past the membrane of the tumor cells and releasing it on demand. The first solution that the researchers came up with was the use of the MENS to deliver the drug. These results can be termed as reliable.

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According to the researchers, there are several advantages of using the nanoparticles as the key drug delivery vehicles into the tumor cells. First, the nanoparticles are in different sizes; hence they can deliver the drug into various organs. Secondly, the nanoparticles have different shapes to steer them to specific targets when loaded with the drug. Third, the nanoparticles are amenable to surface functionalization. Therefore, they can be easily conjugated with specific biomolecules to enable them to overcome the various biological barriers. Lastly, nanoparticle drug delivery is in an excellent position to overcome the multidrug resistance (MDR) experienced in many cancer therapies.

This research article was of great importance. The method used to come up with the findings is reliable. The time allowed for the experiment was three months, which is a good duration, and within the required limits. Additionally, the researchers used a control experiment to determine the effects of their outcomes. The control enables them to have conclusive results. Therefore, the information in this article can go a long way to help doctors administer the drug to their patients once the human trials have been conducted.

Reference:-

Rodzinski, A., Guduru, R., Liang, P., Hadjikhani, A., Stewart, T., & Stimphil, E. et al. (2016). Targeted and controlled anticancer drug delivery and release with magneto-electric nanoparticles. Scientific Reports, 6(1). Doi: 10.1038/srep20867.