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Nanomedicine and Drug Delivery Systems of the Future

Amelia Hawking*

Editorial office, Trade Science Inc., UK

***Corresponding author:** Amelia Hawking, Editorial office, Trade Science Inc., UK, E-mail: hawkss_a@hotmail.com

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Short Commentary

Nanomedicine is one of the most interesting fields of study at the moment. In the last two decades, extensive progress in this area has resulted in the filing of 1500 patents and the execution of scores of clinical trials. Cancer continues to be the perfect example of a condition where nonmedical advances have aided both diagnosis and treatment, as illustrated in the different sections above. The use of nanomedicine and nano-drug delivery systems is undoubtedly the trend that will remain the future arena of research and development for decades to come, by using different forms of nanoparticles for the delivery of an exact volume of drug to the infected cells, such as cancer/tumour cells, without disrupting the physiology of normal cells.

The scale of the nanoparticles seen in this correspondence is not standardised, with some measuring in nanometers and others measuring in sub-micrometers (over 100 nm). More research into materials with more standardised uniformity, as well as drug loading and release capability, is needed. This paper further discusses significant advancements in the use of metal-based nanoparticles for diagnostic purposes. The use of these metals, such as gold and silver, in diagnosis and treatment is an area of investigation that may lead to a greater use of nanomedicines in the future. One source of excitement in this area is gold nanoparticles, which tend to be well absorbed in soft tumor tissues, rendering the tumor vulnerable to radiation-based heat therapy for selective removal (e.g., in the near infrared region). Despite widespread recognition of nanomedicine's and nano-drug delivery systems' future potential, their actual effect on the healthcare system, including cancer treatment and diagnosis, remains minimal. This is due to the fact that the discipline is still relatively young, with just two decades of actual study on the topic and several important fundamental characteristics still unknown.

One of the major future research areas will be the fundamental markers of diseased tissues, such as key biological markers that enable absolute targeting without disrupting the usual cellular mechanism. Finally, as our understanding of diseases at the molecular level improves, or as a nanomaterial-subcellular scale comparable marker recognition improves, the implementation of nanomedicine will progress, opening up new avenues for diagnosis and treatment. As a result, understanding disease molecular signatures will lead to advancements in nanomedicine applications in the future. Beyond what we've covered in this analysis utilising proven nanoprobes and nanotheragnostics, further study is needed to expand the scope of nanomedicine's use. The idea of a controlled release of individual drugs at besieged sites, as well as technologies for assessing these cases, drug impact in tissues/cells, and theoretical mathematical models of prediction, have yet to be mastered. Many nanomedicine trials are based on biomaterials and formulation experiments, which tend to be the early stages of biomedicine applications.

Animal trials and multidisciplinary researches, which take a large amount of time and laboratory funding, would include valuable evidence that may be used in drug therapeutic and diagnosis experiments. The outlook for a more intelligent and multi-centered approach to nanomedicine and nano-drug delivery technologies appears promising, given the growing global movement for more accurate medicines and diagnosis. The simplified vision of developing nanorobots (and nanodevices) that

work in tissue diagnosis and repair mechanisms with complete external control has sparked a lot of interest. This has not yet become a reality, and it remains a theoretical science project that humanity will be able to do in the not-too-distant future. Nanomedicines' possible risks to humans and the world as a whole, like their advantages, need long-term research. As a result, a thorough assessment of the potential acute and chronic toxicity effects of new nanomaterials on humans and the environment is needed. As nanomedicines become more common, another field of research that requires more attention is their affordability. Finally, as discussed in the previous section, nanomedicine control will continue to grow in tandem with developments in nanomedicine applications.