

Annotated Bibliography

Cancer Nanotechnology: From A Treatment Perspective

Bregoli, L., Lysaght, D., Reynolds, J., Prina-Mello, A., Gavigan-Imedio, J., & Lysaght, J. (2015). Nanomedicine applied to translational oncology: A future perspective on cancer treatment. *Nanomedicine: Nanotechnology, Biology And Medicine*, 12(1), 81-103. <http://dx.doi.org/10.1016/j.nano.2015.08.006>

This review article discusses the current available cancer treatments involving nanomedicines, as well as those awaiting clinical approval. Current medicines involving anti-cancer therapy were compared to new introduced nano methods, with both their advantages and disadvantages discussed thoroughly within the article. The authors discussed in detail the different nanomaterial designs which apply to therapeutic applications for treating cancer. These were grouped within well sectioned paragraphs, categorised as current clinically approved nanoparticles and nanoparticles under clinical trial in relation to cancer therapy. The challenges of such technology were well discussed with the authors emphasising on key points which create nanomedicine a modern grand challenge such as the limitation of current technology, the regulatory changes, and the issues with regulating clinical translation and creating harmony between countries in terms of nanomedicine. An overall concise and soundly concluded article, there were no distinguishable biases. All information was well referenced and supported by evidence. This source can be counted for as reliable as it was found through the QUT library database, is peer reviewed and the document itself has a publishers ID as part of their reference. The authors concluded that although an adolescent introduction to the pharmaceutical industry, the greatest limitation to nanomedicine is the lack of specific regulatory requirements which could change with an increased number of public support thus creating investor security. This in turn will encourage researchers to continue to develop nanomedicines and introduce them as the new common method of cancer therapy. Some aspects of the article's discussion were visually aided, assisting with understanding complex concepts especially to readers who are familiarising to such content. Personally, this source has greatly assisted me in building base and in-depth knowledge of the topic and allowed me to continue my research with the understanding of the basic issues and terminology and allowed me to form an educated opinion without prejudice influence from an untrusted author/publisher.

Fontana, F., Liu, D., Hirvonen, J., & Santos, H. (2017). Delivery of therapeutics with nanoparticles: what's new in cancer immunotherapy?. *Wiley Interdisciplinary Reviews: Nanomedicine And Nanobiotechnology*, 9(1), e1421-n/a. <http://dx.doi.org/10.1002/wnan.1421>

This article discusses the alternative methods researches are developing to battle high mortality diseases in patients, one of which is cancer. This article invests its readers interest into the multidisciplinary area of nanotechnology and refers to it as a "revolutionising treatment of diseases in the 21st century". The article emphasises on the development of ways of directly targeting the cancerous area without or little effect to other healthy parts of the body under treatment. Methods in which to develop anti-cancer vaccines are mentioned as a research aspect, with that concept being the basis of this scientific article. Different designs and possibilities are featured within, but are all compared with a mutual advantage over traditional methods of treating cancer. All methods are

being developed and researched with the concept that through specific targeting possible with nanomedicine, there is a greater success rate of cure with better side effects for the patient as well as lower risk and higher safety. The authors also include the future benefits of the currently developing but revolutionising concept, that of which involves tailor made treatments and also the replication of mother nature's structures which currently cannot be recreated in the lab consequently opening up a whole new concept for scientists to explore. There are many visual aids within the article which can be derived for knowledge refreshers instead of repeating the lengthy read which strengthens the articles weaknesses of length and repetitiveness. In addition, this article is not a read for someone extremely new to the topic as it doesn't discuss many of the basics of pharmaceutical nanotechnology. These visual aids are also extremely useful for visualising the multifaceted concepts present in this source. Peer reviewed and published, this source can be considered reliable and is overall great to feature within a report with many referenceable aspects whilst it discusses concepts featured in numerous related articles and published works.

Luo, D., Carter, K., Miranda, D., & Lovell, J. (2017). Chemophototherapy: An Emerging Treatment Option for Solid Tumors. *Advanced Science*, 4(1), 1600106. <http://dx.doi.org/10.1002/advs.201600106>

This review article addresses the issues of the use of chemotherapy to treat cancer patients, which often draws many limitations including dose limitations and developed resistance by the patients. The newly found method of photodynamic and cognitive processing therapies combined with other methods has been a confirmed effective technique to treat a select number of cancers, the authors discuss. The article includes the undoubted benefits of CPT and PTD treatments and give scientific reasoning as to why the amount of clinical trials need to be increased for the procedures when treating cancer. The article doesn't fail to address the challenges faced using such methods, with the authors successfully deliberating the benefits of these methods and use their points outweigh the limitations presented by them. This article introduces different concepts not explored by the other sources found in this research task and could possibly pose some argumentative concepts. Unfortunately, due to the restrictions of the research task the specific use of CPT and PTD as a cancer treatment cannot be further researched. However, this well written, concise review article was an enjoyable read as well as a trusted published source of information supported by the National Institute of Health and the National Science Foundation and peer reviewed.

Manshian, B., Jimenez, J., Himmelreich, U., & Soenen, S. (2017). Presence of an Immune System Increases Anti-Tumor Effect of Ag Nanoparticle Treated Mice. *Advanced Healthcare Materials*, 6(1), 2192-2640. <http://dx.doi.org/10.1002/adhm.201601099>

A full research paper basted on treating subcutaneous tumours models, where the impact of the immune system during the treatment is greatly focused on, a concept which the paper describes as neglected in previous studies. The treatment in this study is greatly related nanotechnology as it uses silver nanoparticles in collaboration with the immune system to test the effectiveness of tumour reduction in the tested mice. With their theory proven correct, the research paper concluded that through the use of Ag NP to attack the test tumours, the immune system itself attacked the Ag NP, causing inflammation and thus naturally fighting the tumour even once the amount of Ag nanoparticles present in the body has reduced. The authors believe that this method can be deemed as effective and believe that further trials should be conducted where the immunomodulatory properties of the tests specimens should be exploited. The concept of treating cancer in this way has been stated by numerous sources, however this paper is the first to discuss in detail the influences of an immune system present. As these concepts have been previously discussed in thorough, the information can already be

proclaimed as reliable to an extent. In addition to this, the work conducted is supported by numerous agencies, is a published work, is peer reviewed and featured in many university and library databases. This study is an excellent example of all the theory presented by the other sources being put in practice as an experiment. The visual data such as the scans of the mice show a great representation of nanotechnology working to solve a difficult issue and has given a great basis of practical theory of understanding for this topic.

Nakamura, Y., Mochida, A., Choyke, P., & Kobayashi, H. (2016). Nanodrug Delivery: Is the Enhanced Permeability and Retention Effect Sufficient for Curing Cancer?. *Bioconjugate Chemistry*, 27(10), 2225-2238. <http://dx.doi.org/10.1021/acs.bioconjchem.6b00437>

This review article explores nanotechnology designs and whether they are adequate in treating cancer. The authors review the many obstacles nanomedicine faces in the aspects of drug delivery. The focus is particularly placed on the resistance of the capillary wall resistance of the yet to be treated tumour. The authors cover the basics of how nanomedicine delivery occurs, and introduce this concept from a more practical and better understanding perspective. The Enhanced Permeability and Retention Effect is the focus of the article, and is well introduced. The concept of the nanoparticle releasing medicine straight into the capillary of a tumour is discussed both from a theoretical and clinical perspective and is demonstrated and diligently explained using many well-made visual aids and diagrams thus simplifying a convoluted topic. This allowed me to gain knowledge at a university level whilst still retaining a solid basis understanding. The thesis is greatly supported and discussed, with the mentioning of limitations of nanomedicine such as political constraints. This article relates to others of this type, addressing similar issues and concepts. Peer reviewed, published and supported by the Intramural Research Program of the NIH, National Cancer Institute and the Centre for Cancer Research, this article has solid evidence supporting it as a trusted source of information.

Shi, Y., Liu, M., Deng, F., Zeng, G., Wan, Q., Zhang, X., & Wei, Y. (2017). Recent progress and development on polymeric nanomaterials for photothermal therapy: a brief overview. *Journal Of Materials Chemistry B*, 5(2), 194-206. <http://dx.doi.org/10.1039/C6TB02249A>

Published this year, the article succinctly discusses the recent progression within nanomedicine in relation to photothermal therapy and its use of polymers. It discusses the recent advancements of polymer molecules being used as photo thermal agents (PTA), a concept already investigated for multiple years according to the source. In direct relation to cancer treatment, the "brief" description is nothing but complex, with much terminology which the meanings for had to be outsourced. In moderate detail, the article speaks of the specifications of the new current developments in the field and draw some conclusions within the review but mainly focus on the conclusion. The authors did however, discuss future possible concepts such as which should be further researched, what information is lacking and the limitations of current developed nanoparticles such as our current ability to regulate the physiochemical properties of nanomaterials questions the current ability of maximising their therapeutic effects. This is a reliable published article, as it was found using the QUT database and is peer reviewed. A lengthy read, this source was difficult to understand as the terminology was extremely advanced. However, much information was gathered and used to gain complexity to previously gained knowledge.

Singh, P., & Bajwa, N. (2016). NANO TECHNICAL TRENDS FOR CANCER TREATMENT: QUANTUM DOTs A SMART DRUG DELIVERY SYSTEM. *International Journal Of Pharmaceutical Sciences And Research*, 7(4), 1360-1374. <http://dx.doi.org/10.13040/IJPSR.0975-8232>

Nanomedicine being only newly introduced to the medical world, the authors discusses a considerable amount of nano-sized drug delivery systems introduced and emphasises on quantum dots. The paper discusses this method in detail and focuses on QD throughout the greater part of the review article. Comparing the effectiveness of such methods with chemotherapy in respect to cancer treatments, the article supports QD as a much more advanced method, concluding that its excellent biocompatibility and low cost and toxicity allow it to overrule the traditional and conventional method of treating cancer using chemotherapy. The benefits are not only fixated on the patient results but also the economic potential such technology can bring. Moreover, the paper discusses the overcome issues of current therapies by using newly developed methods (QD) and provides evidence of why QDs are the best current imaging system through the comparison of their physicochemical properties. This source references a total number of 97 sources within the single review article, showing the authors dedication to providing accurate information from broad views. Peer reviewed, this journal article is a reliable source of information. Using argumentative methods, the authors concluded QDs as one of the best candidates for bioimaging and drug delivery, stating that research is being conducted to safely bring such methods into biomedical application. An overall easy to understand, concise article.

Wong, J., Mohseni, R., Hamidieh, A., MacLaren, R., Habib, N., & Seifalian, A. (2017). Will Nanotechnology Bring New Hope for Gene Delivery?. *Trends In Biotechnology*, 1-18. <http://dx.doi.org/10.1016/j.tibtech.2016.12.009>

This review article discusses the promising outcomes of using organic nanoparticles for gene delivery including the few practical barriers faced by current researchers during the application of these methods. This article provides a great broad definition, stating that “gene therapy compromises the delivery of nucleic acids...to the cell...(thus) introducing genes that encode a fictional protein that is vital in preventing disease progression...”. Providing this at the beginning of the review, the authors were successful at establishing basis knowledge for the reader which is carried on when reading the following sections of the review. The article doesn't fail to mention the widespread benefits for patients when under this treatment and demonstrates this in well written sections and tabulated diagrams. The authors also discuss the limitations of using animal models in concerns of safety, stating that animals aren't an accurate representative of human physiology, leaving toxicity and immunogenicity as major concerns during human application. With hindsight, the review features future perspectives for the technology, binding nanotechnology and gene therapy as a future inseparable concept. Referencing over 90 other published works and discussing concepts featured in many other reviews, this is undoubtedly a reliable source of information. Peer reviewed and featured in databases, this review article is one of many well written pieces based on new concepts of biotechnology. The tabulated visual aids are extremely helpful in understanding the information discussed within the article and allowed for more broad knowledge to be gained.

Xie, J., Yang, Z., Zhou, C., Zhu, J., Lee, R., & Teng, L. (2016). Nanotechnology for the delivery of phytochemicals in cancer therapy. *Biotechnology Advances*, 34(4), 343-353. <http://dx.doi.org/10.1016/j.biotechadv.2016.04.002>

The purpose of this review is to compile the many recent advances made in the field of nanotechnology in relation to the delivery of phytochemicals for the treatment of cancer. In addition, the authors

consider the many mistakes made during previous exploration of this concept during clinical trials and refers to them as “lessons learned”. The review states that “natural phytochemicals derived from plants make up a large portion of potential therapeutic agents used to combat cancer” and uses this statement as the basis of the topics exploration. The authors discuss the benefits of phytochemicals and the aspects overcome by this method in comparison to traditional methods of cancer treatment. Moreover, the obstacles faced when using phytochemicals to treat cancer are written about in this report, providing an understanding of why such theoretically successful methods are stunted in practical settings. These challenges were overcome, thus examples of several commercialised phytochemical nanoparticles were given and comparatively discussed with inclusion to those of which are in different stages of clinical trial. The research in the article is supported by the Natural Science Foundation of China and is peer reviewed, confirming it as a reliable source with relevant information. The authors concluded that significant advanced in the field are yet to come, as knowledge in the field is being rapidly gained. This concept allowed for more specific knowledge of a singular process to be gained, and allows for a better understanding in the processes of medical concepts to be approved.

Zhang, X., & Zhang, P. (2016). Nanotechnology for multimodality treatment of cancer (review). *Oncology Letters*, 12(6), 4883-4886. <http://dx.doi.org/10.3892/ol.2016.5322>

A brief article, this well written review discussed the application of nanotechnology in medicine, particularly in the field of cancer treatment. The review mentions the observations made, such as the influences of agents when formed into nanocarriers. In addition, this review mentions the problems solved by using nanotechnology based techniques. The article includes the formulation of nanocarriers in the physiological environment, their side effects on normal organs and their buildup in the tumour. This article focuses on the ability for nanomaterial to overcome the issue of multidrug resistance, through dosage control of loading agents. Simultaneous delivery is also mentioned, a concept which hasn't been achievable in traditional methods of drug delivery. A well written, short review report, this source is trusted as it has been peer reviewed and references many other peer reviewed sources. However, this article doesn't explore many future concepts and mainly focuses on the current ones developed and makes a short conclusion that the future of the delivery of drugs to a human system will be mainly using nanodelivery. An interesting read, but with the addition of visual aids would be a great review article for basic knowledge and understanding.