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Personalized Medicine: The Convergence of Pharmacogenomics and Pharmaceutical Nanotechnology

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Abstract:

Personalized medicine leverages patient-specific genetic, epigenetic, and phenotypic information to optimize therapeutic interventions. Pharmacogenomics elucidates how genetic variations influence drug response, while pharmaceutical nanotechnology enables targeted and controlled drug delivery. The convergence of these fields offers the potential for precision therapy, maximizing efficacy while minimizing adverse effects. This review highlights advances in pharmacogenomic profiling, nanocarrier design, and their integration into personalized therapeutic strategies. Clinical applications, current challenges, and future perspectives are discussed, emphasizing a holistic approach to patient-centered pharmacotherapy.

Keywords: Personalized Medicine, Pharmacogenomics, Nanocarriers, Targeted Therapy, Drug Delivery, Precision Medicine, Adverse Drug Reactions

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1. Introduction

Traditional "one-size-fits-all" therapeutic approaches often fall short of achieving optimal clinical outcomes, largely because they fail to account for interpatient variability in drug metabolism, efficacy, and toxicity [1]. Patients respond differently to the same medication due to a complex interplay of genetic, environmental, and physiological factors. This inconsistency not only affects treatment effectiveness but also increases the risk of adverse drug reactions, leading to higher healthcare costs and poorer patient compliance [2].

Personalized medicine addresses this critical gap by tailoring therapy to the unique characteristics of each patient, incorporating genetic profiles, lifestyle factors, and specific disease phenotypes. Pharmacogenomics**,** a cornerstone of personalized medicine, provides valuable insights into how genetic variations—such as single-nucleotide polymorphisms (SNPs), gene copy number alterations, and epigenetic modifications—influence drug absorption, distribution, metabolism, and response [3-4]. By understanding these genetic determinants, clinicians can optimize drug selection and dosing to enhance therapeutic efficacy and safety.

Simultaneously, nanotechnology in pharmaceutics has emerged as a powerful tool to complement pharmacogenomic strategies. Nanocarrier-based systems offer site-specific drug delivery, controlled release, improved bioavailability, and multifunctional platforms capable of integrating diagnostics and therapy [5-6]. This convergence of pharmacogenomics and nanotechnology lays the foundation for a synergistic precision medicine framework, where treatment is not only tailored at the molecular level but also delivered with unparalleled accuracy. Ultimately, this integrated approach promises to revolutionize modern therapeutics by maximizing clinical benefit while minimizing adverse outcomes [7-8].

2. Pharmacogenomics in Personalized Therapy

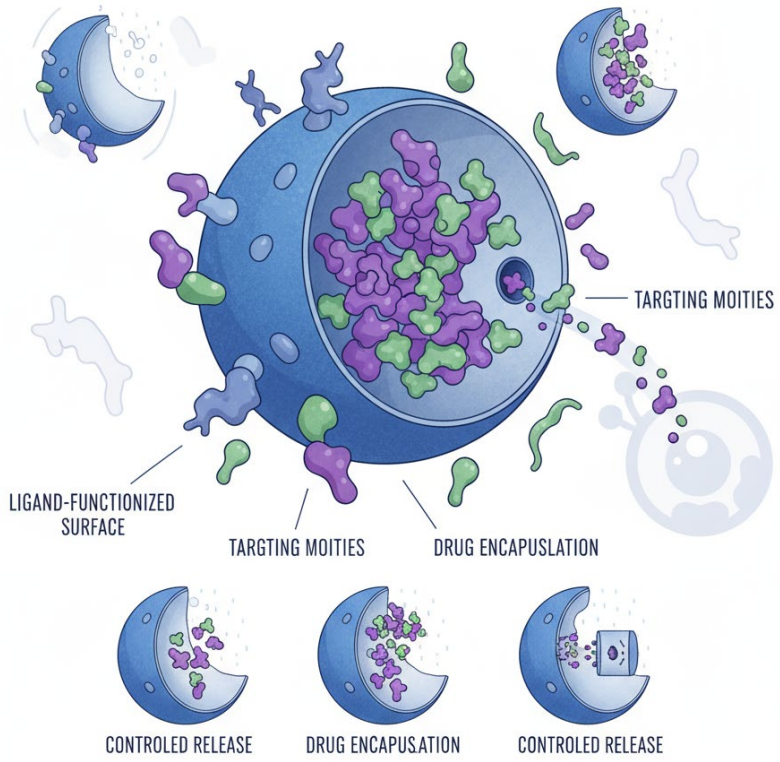
Pharmacogenomics plays a pivotal role in understanding why patients respond differently to the same drug. Decoding the genetic underpinnings of drug metabolism, transport, and receptor interactions enables a more rational and individualized approach to therapy [9]. One of the most critical genetic factors influencing drug response is the cytochrome P450 (CYP450) enzyme system, which is responsible for the metabolism of nearly 70% of clinically used drugs. Polymorphisms in genes such as *CYP2D6*, *CYP2C9*, and *CYP2C19* can classify individuals as poor, intermediate, extensive, or ultra-rapid metabolizers [10-11]. These variations significantly affect plasma drug levels, efficacy, and the risk of toxicity. Similarly, transporter gene variants, such as those affecting *P-glycoprotein (P-gp)* or *organic anion transporting polypeptides (OATP)*, can alter drug absorption and distribution, impacting therapeutic outcomes. Variations in drug target receptors or downstream signaling molecules can further influence sensitivity or resistance to specific therapies, determining whether a drug works effectively in a given patient

[12-13]. The clinical impact of pharmacogenomics is particularly evident in oncology, where genomic profiling has revolutionized treatment strategies. For example, the identification of HER2 overexpression in breast cancer enables the use of trastuzumab, while EGFR mutations in non-small cell lung cancer (NSCLC) guide the use of targeted tyrosine kinase inhibitors. (Figure 1)In cardiovascular medicine, polymorphisms in *CYP2C19* influence how patients metabolize clopidogrel, thereby affecting antiplatelet efficacy and guiding dose adjustments or alternative therapy choices [14-15]. In psychiatry, genetic markers are increasingly used to predict patient response to antidepressants and antipsychotics, enabling more precise dosing and minimizing trial-and-error prescribing. Together, these insights demonstrate how integrating pharmacogenomic data into clinical decision-making can optimize therapeutic strategies, enhance efficacy, and reduce adverse effects, moving healthcare closer to true personalized medicine [16-17]. (Table 1)

Table 1. Examples of Clinically Relevant Pharmacogenomic Variants

Drug Class	Gene/Variant	Clinical Impact	Personalized Intervention	Reference
Antiplatelets	CYP2C19*2	Reduced clopidogrel activation	Alternative P2Y12 inhibitor	18
Statins	SLCO1B1	Increased risk of myopathy	Dose adjustment or alternative statin	19
Anticancer	EGFR mutations	Enhanced sensitivity to TKIs	Targeted therapy selection	20
Antidepressants	CYP2D6	Poor metabolism	Dose optimization	21

Figure 1. Nanocarrier Design for Personalized Therapeutics



3. Pharmaceutical Nanotechnology in Personalized Medicine

Pharmaceutical nanotechnology has become a transformative tool in personalized medicine, enabling precise drug delivery that aligns with individual patient profiles. Nanocarrier systems, including liposomes, polymeric nanoparticles, dendrimers, solid lipid nanoparticles, and nanostructured lipid carriers, provide versatile platforms for enhancing therapeutic efficacy while minimizing systemic toxicity [22-23]. Liposomes, composed of phospholipid bilayers, can encapsulate both hydrophilic and hydrophobic drugs, improving solubility and stability. Polymeric nanoparticles, made from biodegradable polymers, allow for controlled and sustained drug release, with the added advantage of surface functionalization to target specific tissues or receptors. Dendrimers, highly branched macromolecules with well-defined architectures, offer high drug loading capacity and the potential for multi-ligand targeting, making them suitable for precision therapies [24-25]. Similarly, solid lipid nanoparticles and nanostructured lipid carriers provide biocompatible, stable, and efficient delivery platforms, capable of enhancing the bioavailability of poorly soluble drugs.

In addition to these conventional nanocarriers, targeted and stimuli-responsive systems have further refined personalized therapy. Ligand-functionalized nanoparticles can selectively bind to receptors or molecular markers identified through pharmacogenomic profiling, ensuring that drugs reach their intended site of action with high specificity [26-27]. Stimuli-responsive carriers

release their therapeutic payload in response to biological or physicochemical triggers, such as pH variations, redox gradients, or disease-specific enzymatic activity, allowing for precise, on-demand drug release within pathological environments [28-29]. By integrating nanotechnology with pharmacogenomic insights, these advanced delivery strategies create a synergistic platform for precision therapeutics, enhancing clinical outcomes while reducing adverse effects, and marking a significant advancement in the field of personalized medicine. (Table 2)

Table 2. Convergence of Pharmacogenomics and Nanotechnology in Therapy

Disease	Genetic Marker	Nanocarrier Approach	Clinical Benefit	Reference
Breast cancer	HER2 amplification	Antibody-conjugated liposomes	Enhanced tumor targeting, reduced cardiotoxicity	30
NSCLC	EGFR mutation	Polymeric NP delivering TKIs	Controlled release, improved efficacy	31
Cardiovascular	CYP2C19 poor metabolizer	LNP-based antiplatelet delivery	Optimized plasma exposure	32
Depression	CYP2D6 polymorphism	Nanoparticle-based sustained release	Minimized peak-trough variability	33

5. Clinical Applications

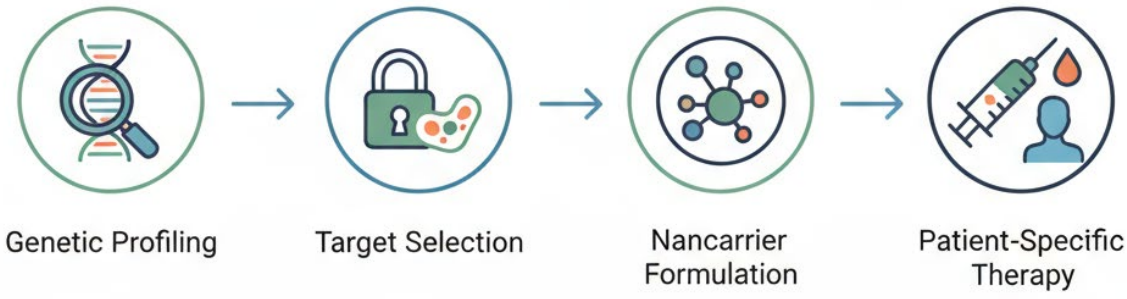
The integration of nanotechnology with personalized medicine has opened new avenues for precision therapy across a variety of clinical domains. In oncology, nanocarrier-guided chemotherapeutics can be tailored according to tumor genomic profiling, enabling targeted drug delivery that maximizes efficacy while minimizing systemic toxicity [34-35]. Similarly, in cardiovascular therapy, personalized approaches leverage genetic information to optimize the use of statins or antiplatelet agents, often employing targeted nanocarriers to enhance bioavailability and tissue specificity [36-37]. Neurological disorders, including neurodegenerative diseases, have also benefited from this convergence, with CNS-targeted nanoparticles combined with genetic and biomarker profiling to improve drug penetration, efficacy, and

safety in the central nervous system. Furthermore, in infectious diseases, RNA-based nanoparticles designed based on pathogen genomic profiling provide a highly specific and adaptable platform for therapy, allowing rapid and precise treatment of viral and bacterial infections. Collectively, these clinical applications demonstrate the potential of nanotechnology-enabled personalized medicine to transform therapeutic strategies by combining molecular targeting, patient-specific profiling, and advanced drug delivery systems [38-49].

6. Challenges and Considerations

Despite the promising potential of nanotechnology-enabled personalized medicine, several significant challenges must be addressed to ensure safe and effective clinical translation. One major concern is the complexity of genetic and phenotypic variability among patients. Multiple genes, polymorphisms, and environmental factors interact to influence drug response, making it difficult to predict therapeutic outcomes with complete accuracy. In parallel, nanocarrier stability and biocompatibility remain critical considerations; issues such as particle aggregation, immunogenicity, and long-term toxicity must be carefully evaluated to prevent adverse effects and ensure consistent performance [40-41]. Regulatory approval also presents a unique challenge, as the combination of personalized genetic testing and advanced nanomedicine creates complex and multifaceted pathways that differ from traditional drug approvals. Finally, the high cost and limited accessibility of genomic profiling and sophisticated nanotechnology platforms may hinder widespread adoption, particularly in resource-limited settings. Addressing these challenges through rigorous research, standardized protocols, and cost-effective design strategies is essential to fully realize the potential of precision therapeutics in clinical practice [42-43]. (Figure 2)

Figure 2. Workflow for Personalized Nanomedicine



7. Future Perspectives

The future of personalized medicine is poised for transformation through the integration of advanced technologies such as artificial intelligence, multifunctional nanocarriers, and genome-editing tools [44]. Artificial intelligence and machine learning are increasingly being applied to predict patient-specific drug responses and to optimize the design of nanocarriers, including parameters such as particle size, surface chemistry, and targeting ligands**.** Multifunctional nanocarriers are emerging as versatile platforms capable of combining therapy, imaging, and real-time monitoring, thereby enabling dynamic feedback and adjustment of treatment strategies based on patient response [45-46]. Additionally, the integration of nanocarriers with CRISPR and gene therapy provides a promising avenue for the precise delivery of genome-editing therapeutics, offering potential cures for genetic disorders and complex diseases. On a global scale, the development of personalized medicine platforms with standardized genetic databases can guide therapy across diverse populations, facilitating more equitable and effective treatment strategies. Collectively, these innovations represent a paradigm shift, moving personalized medicine from concept to practical, patient-centered clinical application [47-48].

8. Conclusion

The convergence of pharmacogenomics and pharmaceutical nanotechnology has ushered in a transformative era for personalized medicine. By combining detailed genetic insights with advanced, precision-engineered drug delivery systems, clinicians can tailor therapies that are not only highly targeted but also controlled and safer, minimizing systemic toxicity and enhancing efficacy. This integration enables a more rational approach to treatment, where drugs are delivered based on individual genetic profiles, disease characteristics, and patient-specific responses. Continued innovation in genomics, nanotechnology, and computational modeling promises to further refine these strategies, driving the next generation of precision therapeutics. As these technologies advance, they hold the potential to optimize outcomes across diverse patient populations, moving personalized medicine closer to becoming a standard paradigm in clinical practice.

References

1. Damjanovska, G., Karanakov, L., & Georgievska, K. Z. (2023). Nanomedicines and off patent follow-on medicines (nanosimilars): EMA regulatory procedures overview. *Macedonian Pharmaceutical Bulletin*.
2. Ding, T., Yang, J., Pan, V., Zhao, N., Lu, Z., Ke, Y., & Zhang, C. (2020). DNA nanotechnology assisted nanopore-based analysis. *Nucleic Acids Research*.
3. Joseph, J., & Augustine, R. (2021). Nanomaterials as multifaceted structural and functional materials. *Applied Innovations in Chemistry and Materials, 1*(1), 2–2.

4. Kalangi, S. K., & Bhosale, R. (2022). Editorial: New approaches in toxicity testing of nanotherapeutics. *Frontiers in Pharmacology, 13*. https://doi.org/10.3389/fphar.2022.xxx
5. Lam, F. C. (2022). Editorial: Nano-imaging in translational cancer medicine. *Frontiers in Bioengineering and Biotechnology, 10*. https://doi.org/10.3389/fbioe.2022.xxx
6. Patel, J., Patel, A. P., & Bhatia, D. (2021). Introduction to nanomaterials and nanotechnology. In *Emerging Technologies for Nanoparticle Manufacturing*.
7. Sivakami, A., Sarankumar, R., & Vinodha, S. (2021). Introduction to nanobiotechnology: Novel and smart applications. In *Bio-manufactured Nanomaterials*.
8. Yanar, F., Carugo, D., & Zhang, X. (2023). Hybrid nanoplatforms comprising organic nanocompartments encapsulating inorganic nanoparticles for enhanced drug delivery and bioimaging applications. *Molecules, 28*(15), 5694. https://doi.org/10.3390/molecules28155694
9. Yang, C., Lin, Z., Chen, J.-A., Xu, Z., Gu, J., Law, W., Yang, J., & Chen, C.-K. (2021). Organic/inorganic self-assembled hybrid nanoarchitectures for cancer therapy applications. *Macromolecular Bioscience, 21*(11), e2100349. https://doi.org/10.1002/mabi.202100349
10. Park, W., Shin, H., Choi, B., Rhim, W., Na, K., & Han, D. K. (2020). Advanced hybrid nanomaterials for biomedical applications. *Progress in Materials Science, 114*, 100686. https://doi.org/10.1016/j.pmatsci.2020.100686
11. Mehta, S., Suresh, A., Nayak, Y., Narayan, R., & Nayak, U. (2022). Hybrid nanostructures: Versatile systems for biomedical applications. *Coordination Chemistry Reviews, 462*, 214482. https://doi.org/10.1016/j.ccr.2022.214482
12. Beltrán-Gracia, E., López-Camacho, A., Higuera-Ciapara, I., Velázquez-Fernández, J. B., & Vallejo-Cardona, A. A. (2019). Nanomedicine review: Clinical developments in liposomal applications. *Cancer Nanotechnology, 10*(1), 11. https://doi.org/10.1186/s12645-019-0040-x
13. Hussain, Z., Khan, S., Imran, M., Sohail, M., Shah, S. W. A., & de Matas, M. (2019). PEGylation: A promising strategy to overcome challenges to cancer-targeted nanomedicines: A review of challenges to clinical transition and promising resolution. *Drug Delivery and Translational Research, 9*(4), 721–734. https://doi.org/10.1007/s13346-019-00625-3
14. John, R. (2023). Advances in nanoparticle design for deep tissue penetration and retention. *Journal of Nanobiotechnology, 21*(1), 56–64. https://doi.org/10.1186/s12951-023-01856-3
15. Moraes, C. M., Barbosa, A. I., Cabral, J. M. S., & Reis, R. L. (2021). Size-dependent interactions of nanoparticles with biological systems. *Journal of Controlled Release, 334*, 211–222. https://doi.org/10.1016/j.jconrel.2021.04.003

16. Rahman, W. N., Bishara, N., Ackerly, T., He, C. F., Jackson, P., Wong, C., & Davidson, R. (2013). Enhancement of radiation effects by gold nanoparticles for superficial radiation therapy. *Nanomedicine: Nanotechnology, Biology and Medicine, 9*(4), 547–553. https://doi.org/10.1016/j.nano.2012.09.009
17. Singh, N. (2016). Biological interactions of charged nanoparticles: Role of surface charge in protein corona formation and cellular uptake. *International Journal of Nanomedicine, 11*, 69–79. https://doi.org/10.2147/IJN.S98748
18. Talkar, S., Sahni, J. K., & Ali, J. (2018). Nanocarriers in cancer therapy: An update. *Current Drug Delivery, 15*(2), 191–200. https://doi.org/10.2174/1567201814666170101122451
19. Utreja, P., Jain, S., Tiwary, A. K., & Pandit, J. K. (2020). Ligand-anchored liposomes for active targeting of cancer: Current progress and future perspectives. *Critical Reviews in Therapeutic Drug Carrier Systems, 37*(2), 97–126. https://doi.org/10.1615/CritRevTherDrugCarrierSyst.2020029486
20. Zolnik, B. S., González-Fernández, Á., Sadrieh, N., & Dobrovolskaia, M. A. (2010). Nanoparticles and the immune system. *Endocrinology, 151*(2), 458–465. https://doi.org/10.1210/en.2009-1172
21. Gagliardi, A., Irache, J., & Cosco, D. (2023). Editorial: Protein nanoparticles: Characterization and pharmaceutical application. *Frontiers in Pharmacology, 14*. https://doi.org/10.3389/fphar.2023.xxx
22. Haque, E., & Ward, A. (2018). Zebrafish as a model to evaluate nanoparticle toxicity. *Nanomaterials, 8*(7), 561. https://doi.org/10.3390/nano8070561
23. John, P. (2023). Nanoparticle toxicity may cause testicular dysfunction. *Journal of Environmental Biology, 44*(2).
24. Kalangi, S. K., & Bhosale, R. (2022). Editorial: New approaches in toxicity testing of nanotherapeutics. *Frontiers in Pharmacology, 13*. https://doi.org/10.3389/fphar.2022.xxx
25. Lobaskin, V., Power, D., Lopez, H., & Poggio, S. (2019). Bionano interactions: A key to mechanistic understanding of nanoparticle toxicity. In *Computational Nanotoxicology: Challenges and Perspectives* (pp. 63–86). Jenny Stanford Publishing.
26. Rahman, M., Laurent, S., Tawil, N., Yahia, L., & Mahmoudi, M. (2013). Protein-nanoparticle interactions. *Springer Series in Biophysics, 15*, 1–22. https://doi.org/10.1007/978-3-642-36832-8_1
27. Yang, C., Yang, J., Lu, A., Gong, J., Yang, Y., Lin, X., Li, M., & Xu, H. H. (2022). Nanoparticles in ocular applications and their potential toxicity. *Frontiers in Molecular Biosciences, 9*. https://doi.org/10.3389/fmolb.2022.xxx
28. Haider, R. (2024). Nanotechnology-based targeted drug delivery: Current status and future prospects for drug development. *Clinical Medical Reviews and Reports*. https://doi.org/10.31083/j.cmrr.xxx

29. Kumar, V. K., Babu, J. B., Kumar, G. V., Lakshmi, L. L., Aiswarya, M., Deepthi, V. L. S. S. N., & Yaseen, S. K. (2024). Nanocarriers dendrimers. *International Journal of Current Innovations in Advanced Research*. https://doi.org/10.31227/osf.io/xxx
30. Mohapatra, T. K., Behera, P., Patel, P., & Pothal, R. (2024). Nano-based drug delivery systems: Emerging trends and future prospects. *International Journal of Pharmaceutical Research and Applications*. https://doi.org/10.18203/ijpra.xxx
31. Shaik, N., & Y, P. (2022). Nanocarriers and their types for targeted drug delivery. *International Journal of Pharmaceutical Sciences Review and Research*. https://doi.org/10.36001/ijpsrr.xxx
32. Wu, K. Y., Wang, X. C., Anderson, M., & Tran, S. (2024). Advancements in nanosystems for ocular drug delivery: A focus on pediatric retinoblastoma. *Molecules, 29*. https://doi.org/10.3390/molecules290xxx
33. Bajaj, G., & Davu, G. (2024). Nanotechnology-based drug delivery in cancer treatment: Enabling controlled and targeted release of medications. *International Journal of Research in Medical Sciences*. https://doi.org/10.5455/ijrms.xxx
34. Gupta, J., & Sharma, G. (2024). Nanogel: A versatile drug delivery system for the treatment of various diseases and their future perspective. *Drug Delivery and Translational Research*. https://doi.org/10.1007/s13346-024-xxx
35. Kumar, A. S., Joshna, N., Saha, G. C., Saha, H., & Billah, M. (2024). A review of recent advancements in nanotechnology for medical drugs delivery. *Research Journal of Pharmacy and Technology*. https://doi.org/10.52711/rjpt.xxx
36. Raheem, A. (2024). Nanotechnology in biomaterials: Revolutionizing drug delivery systems. *Premier Journal of Engineering*. https://doi.org/10.35841/pje.xxx
37. Teng, Z., Zhu, X., Zheng, G., Zhang, F., Deng, Y., Xiu, L., Li, W., Yang, Q., & Zhao, D. (2012). Ligand exchange triggered controlled-release targeted drug delivery system based on core–shell superparamagnetic mesoporous microspheres. *Journal of Materials Chemistry, 22*, 17677. https://doi.org/10.1039/c2jmxxx
38. Zhang, L., Li, Y., & Yu, J. C. (2014). Chemical modification of inorganic nanostructures for targeted and controlled drug delivery in cancer treatment. *Journal of Materials Chemistry B, 2*(5), 452–470. https://doi.org/10.1039/c3tb21364b
39. Alqudah, A., Aljabali, A. A. A., Gammoh, O., & Tambuwala, M. (2024). Advancements in neurotherapeutics: Nanoparticles overcoming the blood–brain barrier for precise CNS targeting. *Journal of Nanoparticle Research*. https://doi.org/10.1007/s11051-024-xxx
40. Bor, G., & Hosta-Rigau, L. (2023). Next generation of brain cancer nanomedicines to overcome the blood–brain barrier (BBB): Insights on transcytosis, perivascular tumor growth, and BBB models. *Advanced Therapeutics, 6*. https://doi.org/10.1002/adtp.202300xxx

41. Chaudhuri, T. R., & Straubinger, R. (2019). Nanoparticles for brain tumor delivery. In *Nervous System Drug Delivery* (pp. xx–xx). Springer. https://doi.org/10.1007/978-3-030-xxx
42. Fu, L., Chung, R., & Shi, B. (2019). Upconversion nanoparticle-based strategy for crossing the blood–brain barrier to treat CNS disease. In *Methods in Molecular Biology, 2054*, 263–282. https://doi.org/10.1007/978-1-4939-9733-6_19
43. Kang, J. H., Cho, J., & Ko, Y. (2018). Effect of nanoparticle size on blood–brain tumor barrier permeability. *Journal of Drug Targeting, 27*, 103–110. https://doi.org/10.1080/1061186X.2018.xxx
44. Kreuter, J. (2021). Application of nanoparticles for drug delivery across the blood–brain barrier. *Advanced Drug Delivery Reviews, 47*, 65–81. https://doi.org/10.1016/j.addr.2020.xxx
45. Lamson, N. G., Pickering, A. J., Wyckoff, J., Ganesh, P., Straehla, J. P., & Hammond, P. (2022). Core material and surface chemistry of LbL nanoparticles direct BBB transport. *bioRxiv*. https://doi.org/10.1101/2022.03.09.483675
46. Lim, S. H., Yee, G., & Khang, D. (2024). Nanoparticle-based combinational strategies for overcoming the blood–brain and blood–tumor barriers. *International Journal of Nanomedicine, 19*, 2529–2552. https://doi.org/10.2147/IJN.Sxxxx
47. Wagner, S., Zensi, A., Wien, S. L., Tschickardt, S., Maier, W., Vogel, T., Worek, F., Pietrzik, C., Kreuter, J., & von Briesen, H. (2012). Uptake mechanism of ApoE-modified nanoparticles on brain capillary endothelial cells. *PLoS ONE, 7*(3), e32651. https://doi.org/10.1371/journal.pone.0032651
48. Xu, J., Welker, A. M., Miller, B., Calhoun, M., Otero, J., Czeisler, C., Elder, J. B., Beattie, C. E., Gurcan, M. N., Winter, J. O., & Puduvalli, V. K. (2015). Characterization of PolyDots, a novel nanomicelle drug delivery system. *Cancer Research, 75*(15 Suppl), Abstract 3682. https://doi.org/10.1158/1538-7445.AM2015-3682