10 best papers with important highlights

1. **B. Parshad**, M. Stadtmueller, M. Baumgardt, K. Ludwig, C. Nie et al. Dual action heteromultivalent glycopolymer stringently block and arrest influenza A virus infection in vitro and ex vivo*. Nano Letters* **2023,** *23*, 4844-4853.
   Summary: This paper presents a breakthrough in antiviral strategies by introducing a low-molecular-weight dual-action glycopolymer that simultaneously targets hemagglutinin and neuraminidase on the Influenza A Virus (IAV) surface. This is the first time dual-targeting low molecular-weight polymers were prepared. The study demonstrates the superior efficacy of the heteromultivalent glycopolymer, which outperforms commercial drugs by up to 10,000 times, marking a significant advancement in broad-spectrum antiviral therapy.

2. C. Nie, **B. Parshad**, Y. Pan, S. Bhatia, R. Haag. Topology-matching design of an influenza neutralizing spiky nano-inhibitor with a dual mode of action. *Angew. Chem. Int. Ed.* **2020**, *59*, 15532-15536.
   Summary: In this study, we extended the concept of dual targeting to nanoparticles. This Study introduces the innovative concept of "topology-matching design" for virus inhibitors. By designing nanoparticles that match the nanotopology of IAV virions, this study demonstrates a dual-action inhibition of the virus, achieving more than 99.999% inhibition even 24 hours post-infection, highlighting its potential as a potent antiviral treatment.

3. C. Nie, M. Stadtmüller, **B. Parshad**, M. Wallert, Y. Kerkhoff *et al.* Heteromultivalent nanostructures as potent and broad-spectrum influenza A virus inhibitors. *Science Advances* **2021***, 7,* eabd3803*.*
   Summary: The work of dual targeting and topology matching was further extended by employing concave nanoparticles designs. This work explores the use of heteromultivalent nanostructures with topology-matched shapes to achieve potent and broad-spectrum inhibition of IAV. The study reveals a significant reduction in virus propagation by over 99.99% at non-toxic doses, offering a promising strategy for developing broad-spectrum antiviral agents.

4. S. Bhatia, M. Hilsch, J. Camacho, K. Ludwig, C. Nie, **B. Parshad** *et al.* Adaptive flexible sialylated nanogels as highly potent influenza A virus inhibitors. *Angew. Chem. Int. Ed.* **2020**, *59*, 12417-12422.
   Summary: As the nanoparticles designed in papers 3 and 4 are rigid and only showed small contact are with viral surface. To enhance the contact angle, In this paper we report on the development of flexible sialylated nanogels that adapt to the virus surface, significantly enhancing inhibition of IAV. The adaptive nature of these nanogels allows for a 400-fold improvement in viral inhibition, presenting a novel approach to designing effective antiviral nanomaterials.

5. R. Randriantsilefisoa, C. Nie, **B. Parshad**, Y. Pan, S. Bhatia, R. Haag. Double trouble for viruses: a hydrogel nanocomposite catches the influenza virus while shrinking and changing color. *Chem. Commun*. **2020**, *56*, 3547-3550.
   Summary: The concept of viral inhibition by nanogels was further extended towards detection/sensing of viral particles. This study introduces a hydrogel nanocomposite that not only traps IAV particles but also exhibits dual responses—shrinking and changing color upon virus detection. This innovative approach offers a novel diagnostic and therapeutic tool for real-time virus detection and inhibition.

10 best papers with important highlights

6. M. Stadtmueller, S. Bhatia, P. Kiran, M. Hilsch, V. Reiter-Scherer, A. Lutz, **B. Parshad** *et al.* Evaluation of Multivalent Sialylated Polyglycerols for Resistance and Broad Antiviral Activity against Influenza Viruses. *J. Med. Chem.* **2021**, *64*, 12774-12789.
   Summary: This work investigates the development of multivalent sialylated polyglycerols as broad-spectrum inhibitors of IAV. By addressing the challenge of strain variability, the study highlights the importance of rational inhibitor design to achieve broad antiviral efficacy, advancing the field of sialic acid-based therapeutics.

7. Y. Pan, S. Zhou, X. Ma, C. Liu, J. Xing, **B. Parshad** *et al.* Retinoic acid loaded dendritic polyglycerol conjugated gold nanostars for targeted photothermal therapy in breast cancer stem cells. *ACS Nano* **2021**, *15*, 15069-15084.
   Summary: This publication presents a novel nanoplatform for targeting breast cancer stem cells (CSCs) using retinoic acid-loaded gold nanostars conjugated with dendritic polyglycerol. The study demonstrates the platform's ability to effectively eradicate CSCs and prevent tumor relapse, offering a promising strategy for improving cancer therapy outcomes.

8. Y. Pan, S. Zhou, C. Liu, X. Ma, J. Xing, **B. Parshad** *et al.* Dendritic polyglycerol-conjugated gold nanostars for metabolism inhibition and targeted photothermal therapy in breast cancer stem cells. *Advanced Healthcare Materials* **2022**, 2102272.
   Summary: In this paper, a multifunctional nanocomposite is developed to target and eradicate breast CSCs by combining photothermal therapy with metabolic inhibition. The study provides a comprehensive approach to overcoming the challenges of CSC-driven tumor relapse and highlights the potential for a synergistic therapeutic strategy.

9. Y. Pan, S. Zhou, Y. Li, **B. Parshad**, W. Li, R. Haag. Novel dendritic polyglycerol-conjugated, mesoporous silica-based targeting nanocarriers for co-delivery of doxorubicin and tariquidar to overcome multidrug resistance in breast cancer stem cells. *J. Control. Rel.* **2021***, 330,* 1106.
   Summary: This research focuses on overcoming multidrug resistance in breast CSCs by developing targeted nanocarriers for co-delivery of doxorubicin and tariquidar. The study demonstrates the effectiveness of these nanocarriers in enhancing drug accumulation and suppressing stemness-associated gene expression, providing a promising approach for treating drug-resistant cancers.

10. Y. Pan, L. Yu, L. Liu, J. Zhang, S. Liang, **B. Parshad** et al. Genetically Engineered Nanomodulators Elicit Potent Immunity against Cancer Stem Cells by Checkpoint Blockade and Hypoxia Relief. *Bioactive Materials* **2024**, 38, 31-44.
    Summary: This paper introduces genetically engineered nanomodulators that combine checkpoint blockade with hypoxia relief to elicit robust immune responses against CSCs. The study highlights the potential of this approach to enhance cancer immunotherapy by effectively eradicating CSCs and overcoming immune evasion mechanisms.