Biochemistry and Structural Biology Research Group (Lab) (Antiviral Drug Discovery)



The research of Biochemistry and Structural Biology Group is focused on antiviral drug discovery, creating knowledge for vaccine development and understanding the molecular level mechanism of viral infections to explore new drug targets. Glycan-protein interactions mediate diverse biological processes, particularly their role in viral pathogenesis is critically important. One of the main areas of our research is to target human-incorporated glycans present at the surface of viruses including HIV, Hepatitis C virus (HCV), dengue virus and SARS-CoV-2 to identify glycan-binding molecules that could block viral entry to the target cell. Moreover, our antiviral drug discovery endeavor incorporates identification and characterization of inhibitors of replication machinery of HCV and SARS-CoV-2 that involves the polymerase and helicase enzymes and non-structural protein 5a (in case of HCV) particularly targeting drug resistant mutants. We are using basic molecular biology, biochemistry and cell culture techniques along with cutting edge NMR based methodologies to understand the molecular recognition at atomic level.

In terms of vaccine research, we are working to understand the role of antibodies in spontaneous clearance of HCV, as around 30% of HCV infected individual clear the virus without any treatment. In this study we are trying to delineate the epitope specificity of antibodies present in the sera of such individuals and characterize structural feature of those linear epitopes in the antibody bound conformation. Such structural information could provide template for immunogen design as potential vaccine. For more detail, see the group's website at (http://biolabs.lums.edu.pk/BSB).

The leading faculty: Dr Syed Shahzad ul Hussan (Associate Professor)

Selected Publications:

- 1. Iftikhar H, Ali HN, Farooq S, Naveed H and Shahzad-ul-Hussan S.*, *Computers in Biology and Medicine* 122, 103848, 2020.
- Shahid M, Qadir A, Yang J, Ahmad I, Zahid H, Mirza S, Windisch MP and Shahzad-ul-Hussan S.* Viruses 12(2); 199; doi.org/10.3390/v12020199, 2020.
- 3. Ahsan A, Khan AZ, Javed H, Mirza S, Chaudhary SU, Shahzad-UI-Hussan S*. *PLoS One*. 14(4):e0214435, 2019.
- 4. Saleem HN, Batool F, Mansoor HJ, **Shahzad-ul-Hussan S**^{*} and Saeed M^{*}. *ACS Omega*. 4, 1525-1533, 2019. (**Corresponding authors*)

- Ashraf MU, Iman K, Khalid MF, Salman HM, Shafi T, Rafi M, Javaid N, Hussain R, Ahmad F, Shahzad-ul-Hussan S, Mirza S, Shafiq M, Afzal S, Hamera S, Anwar S, Qazi R, Idrees M, Qureshi SA, Chaudhary SU. *Med. Res. Rev.*, 39, 1091-1136, 2019.
- 6. Qadir A, Riaz M, Saeed M and Shahzad-ul-Hussan S*. *Eur. J. Med. Chem.*, 156, 444- 460, 2018.
- 7. Ullah R, Dar S, Ahmad T, Renty C, Usman M, Depamphilis M, Faisa A, **Syed Shahzad- ul-Hussan***, Ullah Z*. *Placenta*, 66, 57–64, 2018. (**Corresponding authors*)
- Zhou T, Zheng A, Baxa U, Chuang GY, Georgiev IS, Kong R, O'Dell S, Shahzad-ul-Hussan S, Bewley CA, Burton DR, Polonis VR, Shapiro L, Wong CH, Mascola JR, Kwong PD, Wu X. A et al., *Immunity*, 48, 500-513, 2018.
- 9. Shahzad-ul-Hussan S., Sastry M., Lemmin T., Soto C., Loesgen S., O'Connor R., Lohith K., Davison J. R., Kwong PD and Bewley CA. *Chembiochem*, 18, 764-771, 2017.
- 10. Bewley C A*, Shahzad-ul-Hussan S.* Biopolymers, 99, 796-806, 2013.
- 11. Pancera M*, **Shahzad-ul-Hussan S***, Doria-Rose NA, McLellan JS et al., *Nature Struct. Mol. Biol.*, 20, 804-813, 2013. (**Equal first author contribution*)
- 12. Shahzad-ul-Hussan S, Ghirlando R, Dogo-Isonagie CI, Igarashi Y, Balzarini J, Bewley CA., *J. Am. Chem. Soc.*, 134, 12346-12349, 2012.
- 13. HansmanGS*, **Shahzad-ul-Hussan S***, McLellanJS, ChuangGY, GeorgievI, Shimoike T, Katayama K, Bewley CA, Kwong PD. *J. Virol.*, 86, 284-292, 2012 (**Equal first author contribution*).
- 14. Shahzad-ul-Hussan S, Gustchina E, Ghirlando R, Clore GM, Bewley CA. *J Biol. Chem.*, 286, 20788-20796, 2011.
- McLellan JS, Pancera M, Carrico C, Gorman J, Julien JP, Khayat R, Louder R, Pejchal R, Sastry M, Dai K, O'Dell S*, Patel N*, Shahzad-ul-Hussan S, Yang Y, Zhang B et al., *Nature*, 480, 336-343, 2011.
- 16. Shahzad-ul-Hussan S, Cai M, Bewley CA. J. Am. Chem. Soc., 131, 16500-16508, 2009.