proceedings

MDPI

Proceedings

Potent Inhibition of Zika Virus Replication by Curcumin—Poly(sodium 4-styrenesulfonate) Conjugates †

Magdalena Obłoza [1,*], Paweł Botwina [2,3], Gabriela Czerwonka [1], Krzysztof Szczubiałka [1], Krzysztof Pyrc [2] and Maria Nowakowska [1]

[1] Faculty of Chemistry, Jagiellonian University, Gronostajowa 2, 30-387 Krakow, Poland; cz.gabi@interia.pl (G.C.); k.szczubialka@uj.edu.pl (K.S.); nowakows@chemia.uj.edu.pl (M.N.)
[2] Virogenetics Laboratory of Virology, Malopolska Centre of Biotechnology, Jagiellonian University, Gronostajowa 7a, 30-387 Krakow, Poland; pawel.botwina@doctoral.uj.edu.pl (P.B.); k.a.pyrc@uj.edu.pl (K.P.)
[3] Department of Microbiology, Faculty of Biochemistry, Biophysics and Biotechnology, Jagiellonian University, Gronostajowa 7, 30-387 Krakow, Poland
* Correspondence: m.obloza@uj.edu.pl
† Presented at the 1st International Electronic Conference on Pharmaceutics, 1–15 December 2020; Available online: https://iecp2020.sciforum.net/.

Published: date

Abstract: In recent years, the Zika virus (ZIKV) has emerged from a neglected flavivirus to a health-threating pathogen that causes malformations and microcephaly in neonates as well as neurologic complications in adults. ZIKV is transmitted by mosquitoes of the *Aedes* species, which is also a vector for several other viruses, including yellow fever virus, Chikungunya virus and dengue virus. There is neither vaccine nor drugs available to prevent or treat ZIKV infections. Recently, we have demonstrated that poly(sodium 4-styrenesulfonate) (PSSNa) inhibits ZIKV replication in vitro both in animal and human cells, while no cytotoxicity is observed. Our mechanistic studies indicated that PSSNa acted mostly through direct binding to ZIKV particle and blocking its attachment to the host cells [1]. The anionic macromolecules of PSSNa efficiently interact electrostatically with the ZIKV fusion loop of E protein dimer and the region adjacent to the fusion loop which are positively charged [2]. In a current paper we have concentrated on the synthesis and studies of the antiviral activity of novel polymeric curcumin-PSSNa conjugate. Curcumin (Cur) is the active component of dried root of *Curcuma longa,* an herb belonging to ginger family, with wide antimicrobial activity. Its practical application is, however, strongly limited by its low solubility/bioavailability and instability. We have demonstrated that these problems can be eliminated by using the Cur-PSSNa conjugate instead of Cur itself. More importantly, we have observed that Cur-PSSNa shows much stronger anti-ZIKV activity than PSSNa polymer of similar average molecular weight. That can be explained considering the synergistic effect of both conjugate components involving targeted Cur delivery by the active polymeric delivery agent.

Keywords: Zika virus; antiviral; polymer; curcumin; flavivirus

Acknowledgments: This research was operated within the National Science Center (NCN), Project No. 2017/27/B/ST5/01108.

References

1. Botwina, P.; Obłoza, M.; Szczepański, A.; Szczubiałka, K.; Nowakowska, M.; Pyrć, K. In Vitro Inhibition of Zika Virus Replication with Poly(Sodium 4-Styrenesulfonate). *Viruses* **2020**, *12*, 926.
2. Dai, L.; Song, J.; Lu, X.; Deng, Y.Q.; Musyoki, A.M.; Cheng, H.; Zhang, Y.; Yuan, Y.; Song, H.; Haywood, J.; et al. Structures of the Zika Virus Envelope Protein and Its Complex with a Flavivirus Broadly Protective Antibody. *Cell Host Microbe* **2016**, *19*, 696.