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**Literatura a zdroje**

1. Gates, B. *The next outbreak? We're not ready (Bill Gates | TED2015):2015.* <https://www.ted.com/talks/bill_gates_the_next_outbreak_we_re_not_ready>
2. Desai, M. C.; Meanwell, N. A. *Successful Strategies for the Discovery of Antiviral Drugs*. Cambridge: Royal Society of Chemistry: 2013. <https://pubs.rsc.org/en/content/ebook/978-1-84973-657-2>
3. Wong, S. S. Y.; Yuen, K. Y. Antiviral therapy for respiratory tract infections. *Respirology* **2008,** 13, 950-971. <https://onlinelibrary.wiley.com/doi/full/10.1111/j.1440-1843.2008.01404.x>
4. Felicetti, T.; Manfroni, G.; Cecchetti, V.; Cannalire, R. Broad-Spectrum Flavivirus Inhibitors: a Medicinal Chemistry Point of View. *ChemMedChem*. In press. <https://doi.org/10.1002/cmdc.202000464>
5. Adalja, A.; Inglesby, T. Broad-Spectrum Antiviral Agents: A Crucial Pandemic Tool. *Expert Review of Anti-Infective Therapy* **2019,** 17, 467-470. <https://doi.org/10.1080/14787210.2019.1635009>
6. Eyer, L.; Nencka, R.; de Clercq, E.; Seley-Radtke, K.; Růžek, D. Nucleoside analogs as a rich source of antiviral agents active against arthropod-borne flaviviruses. *Antiviral Chemistry and Chemotherapy* **2018,** 26, 2040206618761299. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5890575/>
7. De Clercq, E.; Li, G. D. Approved Antiviral Drugs over the Past 50 Years. *Clinical Microbiology Reviews* **2016,** 29, 695-747. <https://cmr.asm.org/content/29/3/695.long>
8. De Clercq, E. The design of drugs for HIV and HCV. *Nature Reviews Drug Discovery* **2007,** 6, 1001-1018. <https://www.nature.com/articles/nrd2424>
9. Seley-Radtke, K. L.; Yates, M. K. The evolution of nucleoside analogue antivirals: A review for chemists and non-chemists. Part 1: Early structural modifications to the nucleoside scaffold. *Antiviral Research* **2018,** 154, 66-86. <https://www.sciencedirect.com/science/article/abs/pii/S0166354218306375>
10. Edinger, T. O.; Pohl, M. O.; Stertz, S. Entry of influenza A virus: host factors and antiviral targets. *Journal of General Virology* **2014,** 95, 263-277. <https://www.microbiologyresearch.org/content/journal/jgv/10.1099/vir.0.059477-0>
11. Linero, F. N.; Sepulveda, C. S.; Giovannoni, F.; Castilla, V.; Garcia, C. C.; Scolaro, L. A.; Damonte, E. B. Host Cell Factors as Antiviral Targets in Arenavirus Infection. *Viruses-Basel* **2012,** 4, 1569-1591. <https://www.mdpi.com/1999-4915/4/9/1569>
12. Brown, A. J.; Won, J. J.; Graham, R. L.; Dinnon, K. H.; Sims, A. C.; Feng, J. Y.; Cihlar, T.; Denison, M. R.; Baric, R. S.; Sheahan, T. P. Broad spectrum antiviral remdesivir inhibits human endemic and zoonotic deltacoronaviruses with a highly divergent RNA dependent RNA polymerase. *Antiviral Research* **2019,** 169. <https://www.sciencedirect.com/science/article/abs/pii/S0166354219300993?via%3Dihub>
13. Warren, T. K.; Jordan, R.; Lo, M. K.; Ray, A. S.; Mackman, R. L.; Soloveva, V.; Siegel, D.; Perron, M.; Bannister, R.; Hui, H. C.; Larson, N.; Strickley, R.; Wells, J.; Stuthman, K. S.; Van Tongeren, S. A.; Garza, N. L.; Donnelly, G.; Shurtleff, A. C.; Retterer, C. J.; Gharaibeh, D.; Zamani, R.; Kenny, T.; Eaton, B. P.; Grimes, E.; Welch, L. S.; Gomba, L.; Wilhelmsen, C. L.; Nichols, D. K.; Nuss, J. E.; Nagle, E. R.; Kugelman, J. R.; Palacios, G.; Doerffler, E.; Neville, S.; Carra, E.; Clarke, M. O.; Zhang, L. J.; Lew, W.; Ross, B.; Wang, Q.; Chun, K.; Wolfe, L.; Babusis, D.; Park, Y.; Stray, K. M.; Trancheva, I.; Feng, J. Y.; Barauskas, O.; Xu, Y. L.; Wong, P.; Braun, M. R.; Flint, M.; McMullan, L. K.; Chen, S. S.; Fearns, R.; Swaminathan, S.; Mayers, D. L.; Spiropoulou, C. F.; Lee, W. A.; Nichol, S. T.; Cihlar, T.; Bavari, S. Therapeutic efficacy of the small molecule GS-5734 against Ebola virus in rhesus monkeys. *Nature* **2016,** 531, 381-385. <https://www.nature.com/articles/nature17180>
14. <https://www.vakciny.net>
15. Mulligan, M. J.; Lyke, K. E.; Kitchin, N.; Absalon, J.; Gurtman, A.; Lockhart, S.; Neuzil, K.; Raabe, V.; Bailey, R.; Swanson, K. A.; Li, P.; Koury, K.; Kalina, W.; Cooper, D.; Fontes-Garfias, C.; Shi, P. Y.; Tureci, O.; Tompkins, K. R.; Walsh, E. E.; Frenck, R.; Falsey, A. R.; Dormitzer, P. R.; Gruber, W. C.; Sahin, U.; Jansen, K. U. Phase I/II study of COVID-19 RNA vaccine BNT162b1 in adults. *Nature* **2020,** 586, 589-593. <https://www.nature.com/articles/s41586-020-2639-4>
16. Jackson, L. A.; Anderson, E. J.; Rouphael, N. G.; Roberts, P. C.; Makhene, M.; Coler, R. N.; McCullough, M. P.; Chappell, J. D.; Denison, M. R.; Stevens, L. J.; Pruijssers, A. J.; McDermott, A.; Flach, B.; Doria-Rose, N. A.; Corbett, K. S.; Morabito, K. M.; O'Dell, S.; Schmidt, S. D.; Swanson, P. A.; Padilla, M.; Mascola, J. R.; Neuzil, K. M.; Bennett, H.; Sun, W.; Peters, E.; Makowski, M.; Albert, J.; Cross, K.; Buchanan, W.; Pikaart-Tautges, R.; Ledgerwood, J. E.; Graham, B. S.; Beigel, J. H.; m, R. N. A. S. G. An mRNA Vaccine against SARS-CoV-2-Preliminary Report. *New England Journal of Medicine* **2020,** 383, 1920-1931. <https://www.nejm.org/doi/full/10.1056/nejmoa2022483>
17. Folegatti, P. M.; Ewer, K. J.; Aley, P. K.; Angus, B.; Becker, S.; Belij-Rammerstorfer, S.; Bellamy, D.; Bibi, S.; Bittaye, M.; Clutterbuck, E. A.; Dold, C.; Faust, S. N.; Finn, A.; Flaxman, A. L.; Hallis, B.; Heath, P.; Jenkin, D.; Lazarus, R.; Makinson, R.; Minassian, A. M.; Pollock, K. M.; Ramasamy, M.; Robinson, H.; Snape, M.; Tarrant, R.; Voysey, M.; Green, C.; Douglas, A. D.; Hill, A. V. S.; Lambe, T.; Gilbert, S. C.; Pollard, A. J.; Oxford, C. V. T. G. Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: a preliminary report of a phase 1/2, single-blind, randomised controlled trial. *Lancet* **2020,** 396, 467-478. <https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)31604-4/fulltext>
18. Sadoff, J.; Le Gars, M.; Shukarev, G.; Heerwegh, D.; Truyers, C.; de Groot, A. M.; Stoop, J.; Tete, S.; Van Damme, W.; Leroux-Roels, I.; Berghmans, P.-J.; Kimmel, M.; Van Damme, P.; De Hoon, J.; Smith, W.; Stephenson, K.; Barouch, D.; De Rosa, S.; Cohen, K.; McElrath, J.; Cormier, E.; Scheper, G.; Hendriks, J.; Struyf, F.; Douoguih, M.; Van Hoof, J.; Schuitemaker, H. Safety and immunogenicity of the Ad26.COV2.S COVID-19 vaccine candidate: interim results of a phase 1/2a, double-blind, randomized, placebo-controlled trial. *medRxiv* **2020**, 2020.09.23.20199604. <https://www.medrxiv.org/content/10.1101/2020.09.23.20199604v1>
19. Keech, C.; Albert, G.; Cho, I.; Robertson, A.; Reed, P.; Neal, S.; Plested, J. S.; Zhu, M.; Cloney-Clark, S.; Zhou, H.; Smith, G.; Patel, N.; Frieman, M. B.; Haupt, R. E.; Logue, J.; McGrath, M.; Weston, S.; Piedra, P. A.; Desai, C.; Callahan, K.; Lewis, M.; Price-Abbott, P.; Formica, N.; Shinde, V.; Fries, L.; Lickliter, J. D.; Griffin, P.; Wilkinson, B.; Glenn, G. M. Phase 1-2 Trial of a SARS-CoV-2 Recombinant Spike Protein Nanoparticle Vaccine. *N Engl J Med* **2020,** 383, 2320-2332. <https://www.nejm.org/doi/10.1056/NEJMoa2026920>
20. Smith, T. R. F.; Patel, A.; Ramos, S.; Elwood, D.; Zhu, X. Z.; Yan, J.; Gary, E. N.; Walker, S. N.; Schultheis, K.; Purwar, M.; Xu, Z. Y.; Walters, J.; Bhojnagarwala, P.; Yang, M.; Chokkalingam, N.; Pezzoli, P.; Parzych, E.; Reuschel, E. L.; Doan, A.; Tursi, N.; Vasquez, M.; Choi, J.; Tello-Ruiz, E.; Maricic, I.; Bah, M. A.; Wu, Y. H.; Amante, D.; Park, D. H.; Dia, Y.; Ali, A. R.; Zaidi, F. I.; Generotti, A.; Kim, K. Y.; Herring, T. A.; Reeder, S.; Andrade, V. M.; Buttigieg, K.; Zhao, G.; Wu, J. M.; Li, D.; Bao, L. L.; Liu, J. N.; Deng, W.; Qin, C.; Brown, A. S.; Khoshnejad, M.; Wang, N. S.; Chu, A.; Wrapp, D.; McLellan, J. S.; Muthumani, K.; Wang, B.; Carroll, M. W.; Kim, J. J.; Boyer, J.; Kulp, D. W.; Humeau, L.; Weiner, D. B.; Broderick, K. E. Immunogenicity of a DNA vaccine candidate for COVID-19. *Nature Communications* **2020,** 11. <https://www.nature.com/articles/s41467-020-16505-0>
21. Rauch, S.; Roth, N.; Schwendt, K.; Fotin-Mleczek, M.; Mueller, S. O.; Petsch, B. mRNA based SARS-CoV-2 vaccine candidate CVnCoV induces high levels of virus neutralizing antibodies and mediates protection in rodents. *bioRxiv* **2020**, 2020.10.23.351775. <https://www.biorxiv.org/content/10.1101/2020.10.23.351775v1>
22. Fields, B. N., Knipe, D. M., Howley, P. M. *Fields virology. 5th ed.* Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins: 2007. <https://shop.lww.com/Fields-Virology/p/9781451105636>
23. Taylor, M. W. *Viruses and Man: A History of Interactions.* Cham: Springer International Publishing : Imprint: Springer: 2014. <https://www.springer.com/gp/book/9783319077574>
24. Reynolds, M. G.; Doty, J. B.; McCollum, A. M.; Olson, V. A.; Nakazawa, Y. Monkeypox re-emergence in Africa: a call to expand the concept and practice of One Health. *Expert Review of Anti-Infective Therapy* **2019,** 17, 129-139. <https://www.tandfonline.com/doi/abs/10.1080/14787210.2019.1567330?journalCode=ierz20>
25. Woolhouse, M. E. J.; Brierley, L.; McCaffery, C.; Lycett, S. Assessing the Epidemic Potential of RNA and DNA Viruses. *Emerging Infectious Diseases* **2016,** 22, 2037-2044. <https://wwwnc.cdc.gov/eid/article/22/12/16-0123_article>
26. Switzer, W. M.; Salemi, M.; Qari, S. H.; Jia, H.; Gray, R. R.; Katzourakis, A.; Marriott, S. J.; Pryor, K. N.; Wolfe, N. D.; Burke, D. S.; Folks, T. M.; Heneine, W. Ancient, independent evolution and distinct molecular features of the novel human T-lymphotropic virus type 4. *Retrovirology* **2009,** 6. <https://retrovirology.biomedcentral.com/articles/10.1186/1742-4690-6-9>
27. Zheng, H. Q.; Wolfe, N. D.; Sintasath, D. M.; Tamoufe, U.; LeBreton, M.; Djoko, C. F.; Diffo, J. L.; Pike, B. L.; Heneine, W.; Switzer, W. M. Emergence of a novel and highly divergent HTLV-3 in a primate hunter in Cameroon. *Virology* **2010,** 401, 137-145. <https://www.sciencedirect.com/science/article/pii/S0042682210001637>
28. White, D. O., Fenner, F. J. *Medical Virology, 4th ed*. San Diego: Academic Press: 1994.
29. Strauss, J. H., Strauss, E. G. *Viruses and Human Disease. Second Edition.* San Diego: Academic Press: 2007. <https://www.elsevier.com/books/viruses-and-human-disease/strauss/978-0-12-373741-0>
30. Jansen, H. J.; Breeveld, F. J.; Stijnis, C.; Grobusch, M. P. Biological warfare, bioterrorism, and biocrime. *Clinical Microbiology and Infection* **2014,** 20, 488-496. <https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X(14)64173-2/fulltext>
31. Millett, P. D. The Biological Weapons Convention: From International Obligations to Effective National Action. *Applied Biosafety* **2010**, 15(3), 113-118. <https://doi.org/10.1177/153567601001500303>
32. Centers for Disease Control and Prevention (CDC). Emergency Preparedness and Response. Bioterrorism Anthrax. <https://www.cdc.gov/anthrax/bioterrorism/index.html>
33. Frischknecht, F. The history of biological warfare - Human experimentation, modern nightmares and lone madmen in the twentieth century. *Embo Reports* **2003,** 4, S47-S52. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1326439/>
34. Smart, J. K. *History of chemical and biological warfare: an American perspective.* In: Smart JK, Sidel FR, Takafuji ET, Franz DR, (eds). *Medical Aspects of Chemical and Biological Warfare.* Washington DC:Borden Institute, Walter Reed Army Medical Center: 1997.
35. Powell W. The Anarchist Cookbook. New York: L. Stuart: 1971.
36. Olson, K. B. Aum Shinrikyo: once and future threat? *Emerging Infectious Diseases* **1999,** 5, 513-6. <https://wwwnc.cdc.gov/eid/article/5/4/99-0409_article>
37. Andersen, K. G.; Rambaut, A.; Lipkin, W. I.; Holmes, E. C.; Garry, R. F. The proximal origin of SARS-CoV-2. *Nature Medicine* **2020**, 26, 450–452. <https://www.nature.com/articles/s41591-020-0820-9>
38. Cello, J.; Paul, A. V.; Wimmer, E. Chemical synthesis of poliovirus cDNA: Generation of infectious virus in the absence of natural template. *Science* **2002,** 297, 1016-1018. <https://science.sciencemag.org/content/297/5583/1016>
39. Darling, R.G., Burgess, T.H., Lawler, J.V., Endy, T.P. *Virologic and Pathogenic Aspects of the Variola Virus (Smallpox) as a Bioweapon.* In: Lindler, L.E., Lebeda, F.J., Korch, G.W. (eds). *Biological Weapons Defense. Infectious Disease.* Humana Press. 2005. <https://link.springer.com/chapter/10.1385/1-59259-764-5:099>
40. Vyhláška č. 474/2002 Sb. kterou se provádí zákon č. 281/2002 Sb., o některých opatřeních souvisejících se zákazem bakteriologických (biologických) a toxinových zbraní a o změně živnostenského zákona. <https://www.sujb.cz/fileadmin/sujb/docs/legislativa/vyhlasky/vyhlaska_474_verze_2013.pdf>
41. Yeh, J. Y.; Seo, H. J.; Park, J. Y.; Cho, Y. S.; Cho, I. S.; Lee, J. H.; Hwang, J. M.; Choi, I. S. Livestock Agroterrorism: The Deliberate Introduction of a Highly Infectious Animal Pathogen. *Foodborne Pathogens and Disease* **2012,** 9, 869-877. <https://www.liebertpub.com/doi/10.1089/fpd.2012.1146>
42. Alexandersen, S.; Zhang, Z.; Donaldson, A. I.; Garland, A. J. M. The pathogenesis and diagnosis of foot-and-mouth disease. *Journal of Comparative Pathology* **2003,** 129, 1-36. <https://www.sciencedirect.com/science/article/abs/pii/S0021997503000410?via%3Dihub>