7 REFERENCES

Abdelsattar A.S., Abdelrahman F., Dawoud A., Connerton I.F., El-Shibiny A. (2019) Encapsulation of E. coli phage ZCEC5 in chitosan–alginate beads as a delivery system in phage therapy. AMB Express 9:87. DOI: 10.1186/s13568-019-0810-9.

Abdelsattar A.S., Yakoup A.Y., khaled Y., Safwat A., El-Shibiny A. (2023) The synergistic effect of using bacteriophages and chitosan nanoparticles against pathogenic bacteria as a novel therapeutic approach. International Journal of Biological Macromolecules 228:374-384. DOI: https://doi.org/10.1016/j.ijbiomac.2022.12.246.

Abebe G.M.J.I.j.o.m. (2020) The role of bacterial biofilm in antibiotic resistance and food contamination 2020.

Adnan M., Ali Shah M.R., Jamal M., Jalil F., Andleeb S., Nawaz M.A., Pervez S., Hussain T., Shah I., Imran M., Kamil A. (2020) Isolation and characterization of bacteriophage to control multidrug-resistant Pseudomonas aeruginosa planktonic cells and biofilm. Biologicals 63:89-96. DOI: https://doi.org/10.1016/j.biologicals.2019.10.003.

Ahmadi H., Radford D., Kropinski A.M., Lim L.-T., Balamurugan S. (2017) Thermal-Stability and Reconstitution Ability of Listeria Phages P100 and A511 8. DOI: 10.3389/fmicb.2017.02375.

Akhwale J.K., Rohde M., Rohde C., Bunk B., Spröer C., Boga H.I., Klenk H.P., Wittmann J. (2019) Isolation, characterization and analysis of bacteriophages from the haloalkaline lake Elmenteita, Kenya. PLoS One 14:e0215734. DOI: 10.1371/journal.pone.0215734.

Allué-Guardia A., Jofre J., Muniesa M. (2012) Stability and infectivity of cytolethal distending toxin type V gene-carrying bacteriophages in a water mesocosm and under different inactivation conditions. Appl Environ Microbiol 78:5818-23. DOI: 10.1128/aem.00997-12.

Alves P.M., Al-Badi E., Withycombe C., Jones P.M., Purdy K.J., Maddocks S.E. (2018) Interaction between Staphylococcus aureus and Pseudomonas aeruginosa is beneficial for colonisation and pathogenicity in a mixed biofilm. Pathog Dis 76. DOI: 10.1093/femspd/fty003.

Amankwah S., Abdella K., Kassa T. (2021) Bacterial Biofilm Destruction: A Focused Review On The Recent Use of Phage-Based Strategies With Other Antibiofilm Agents. Nanotechnol Sci Appl 14:161-177. DOI: 10.2147/nsa.S325594.

Anjum M.M., Patel K.K., Dehari D., Pandey N., Tilak R., Agrawal A.K., Singh S. (2021) Anacardic acid encapsulated solid lipid nanoparticles for Staphylococcus aureus biofilm therapy: chitosan and DNase coating improves antimicrobial activity. Drug Delivery and Translational Research 11:305-317. DOI: 10.1007/s13346-020-00795-4.

Ansari M.A., Khan H.M., Khan A.A., Cameotra S.S., Pal R. (2014) Antibiofilm efficacy of silver nanoparticles against biofilm of extended spectrum β-lactamase isolates of Escherichia coli and Klebsiella pneumoniae. Applied Nanoscience 4:859-868. DOI: 10.1007/s13204-013-0266-1.

Aranaz I., Alcántara A.R., Civera M.C., Arias C., Elorza B., Heras Caballero A., Acosta N. (2021) Chitosan: An Overview of Its Properties and Applications. Polymers (Basel) 13. DOI: 10.3390/polym13193256.

Askoura M., Saed N., Enan G., Askora A. (2021) Characterization of Polyvalent Bacteriophages Targeting Multidrug-Resistant Klebsiella pneumonia with Enhanced Anti-Biofilm Activity. Applied Biochemistry and Microbiology 57:117-126. DOI: 10.1134/S000368382101004X.

Ayukekbong J.A., Ntemgwa M., Atabe A.N. (2017) The threat of AMR in developing countries: causes and control strategies. Antimicrobial Resistance & Infection Control 6:47. DOI: 10.1186/s13756-017-0208-x.

Azad A.K., Sermsintham N., Chandrkrachang S., Stevens W.F. (2004) Chitosan membrane as a wound-healing dressing: characterization and clinical application. J Biomed Mater Res B Appl Biomater 69:216-22. DOI: 10.1002/jbm.b.30000.

Baghel S., Nair V.S., Pirani A., Sravani A.B., Bhemisetty B., Ananthamurthy K., Aranjani J.M., Lewis S.A. (2020a) Luliconazole-loaded nanostructured lipid carriers for topical treatment of superficial Tinea infections. Dermatol Ther 33:e13959. DOI: 10.1111/dth.13959.

Baghel S., Nair V.S., Pirani A., Sravani A.B., Bhemisetty B., Ananthamurthy K., Aranjani J.M., Lewis S.A. (2020b) Luliconazole-loaded nanostructured lipid carriers for topical treatment of superficial Tinea infections. Dermatologic Therapy 33:e13959. DOI: https://doi.org/10.1111/dth.13959.

Basak S., Singh P., Rajurkar M. (2016) Multidrug Resistant and Extensively Drug Resistant Bacteria: A Study. J Pathog 2016:4065603. DOI: 10.1155/2016/4065603.

Branski L.K., Al-Mousawi A., Rivero H., Jeschke M.G., Sanford A.P., Herndon D.N. (2009) Emerging infections in burns. Surg Infect (Larchmt) 10:389-97. DOI: 10.1089/sur.2009.024.

Brives C., Pourraz J. (2020) Phage therapy as a potential solution in the fight against AMR: obstacles and possible futures. Palgrave Communications 6:100. DOI: 10.1057/s41599-020-0478-4.

Brogna R., Oldenhof H., Sieme H., Figueiredo C., Kerrinnes T., Wolkers W.F. (2020) Increasing storage stability of freeze-dried plasma using trehalose. PLoS One 15:e0234502. DOI: 10.1371/journal.pone.0234502.

Byarugaba D.K. (2010) Mechanisms of Antimicrobial Resistance, in: A. d. J. Sosa, et al. (Eds.), Antimicrobial Resistance in Developing Countries, Springer New York, New York, NY. pp. 15-26.

Carrigy N.B., Liang L., Wang H., Kariuki S., Nagel T.E., Connerton I.F., Vehring R. (2020) Trileucine and Pullulan Improve Anti-Campylobacter Bacteriophage Stability in Engineered Spray-Dried Microparticles. Annals of Biomedical Engineering 48:1169-1180. DOI: 10.1007/s10439-019-02435-6.

Cevallos-Urena A., Kim J.Y., Kim B.S. (2023) Vibrio-infecting bacteriophages and their potential to control biofilm. Food Science and Biotechnology. DOI: 10.1007/s10068-023-01361-7.

Chang Y., Shin H., Lee J.H., Park C.J., Paik S.Y., Ryu S. (2015) Isolation and Genome Characterization of the Virulent Staphylococcus aureus Bacteriophage SA97. Viruses 7:5225-42. DOI: 10.3390/v7102870.

Chatterjee S., Biswas N., Datta A., Dey R., Maiti P. (2014) Atomic force microscopy in biofilm study. Microscopy (Oxf) 63:269-78. DOI: 10.1093/jmicro/dfu013.

Chegini Z., Khoshbayan A., Taati Moghadam M., Farahani I., Jazireian P., Shariati A. (2020) Bacteriophage therapy against Pseudomonas aeruginosa biofilms: a review. Annals of Clinical Microbiology and Antimicrobials 19:45. DOI: 10.1186/s12941-020-00389-5.

Christaki E., Marcou M., Tofarides A. (2020) Antimicrobial Resistance in Bacteria: Mechanisms, Evolution, and Persistence. Journal of Molecular Evolution 88:26-40. DOI: 10.1007/s00239-019-09914-3.

Church D., Elsayed S., Reid O., Winston B., Lindsay R. (2006a) Burn wound infections. Clinical microbiology reviews 19:403-434.

Church D., Elsayed S., Reid O., Winston B., Lindsay R. (2006b) Burn wound infections. Clin Microbiol Rev 19:403-34. DOI: 10.1128/cmr.19.2.403-434.2006.

Congress M.A. (1939) Bactériophage absorption by blood cells and bacteria. The Journal of Infectious Diseases, 64:83-88.

Daly A.C., Riley L., Segura T., Burdick J.A. (2020) Hydrogel microparticles for biomedical applications. Nat Rev Mater 5:20-43. DOI: 10.1038/s41578-019-0148-6.

Dantas M.G.B., Reis S.A.G.B., Damasceno C.M.D., Rolim L.A., Rolim-Neto P.J., Carvalho F.O., Quintans-Junior L.J., Almeida J.R.G.d.S. (2016) Development and Evaluation of Stability of a Gel Formulation Containing the Monoterpene

Borneol. The Scientific World Journal 2016:7394685. DOI: 10.1155/2016/7394685.

DBT (with Research Councils United Kingdom). Scoping report on antimicrobial resistance in India D.o.B., Government of India (GoI), 2017.

de la Fuente-Núñez C., Reffuveille F., Fernández L., Hancock R.E. (2013) Bacterial biofilm development as a multicellular adaptation: antibiotic resistance and new therapeutic strategies. Curr Opin Microbiol 16:580-9. DOI: 10.1016/j.mib.2013.06.013.

Dehari D., Mehata A.K., Priya V., Parbat D., Kumar D., Srivastava A.K., Singh S., Agrawal A.K. (2022) Luliconazole Nail Lacquer for the Treatment of Onychomycosis: Formulation, Characterization and In Vitro and Ex Vivo Evaluation. AAPS PharmSciTech 23:175. DOI: 10.1208/s12249-022-02324-7.

DeLeon S., Clinton A., Fowler H., Everett J., Horswill A.R., Rumbaugh K.P. (2014) Synergistic interactions of Pseudomonas aeruginosa and Staphylococcus aureus in an in vitro wound model. Infect Immun 82:4718-28. DOI: 10.1128/iai.02198-14.

Donelli G., Vuotto C. (2014) Biofilm-based infections in long-term care facilities. Future Microbiol 9:175-88. DOI: 10.2217/fmb.13.149.

Duarte A.C., Fernández L., De Maesschalck V., Gutiérrez D., Campelo A.B., Briers Y., Lavigne R., Rodríguez A., García P. (2021) Synergistic action of phage phiIPLA-RODI and lytic protein CHAPSH3b: a combination strategy to target Staphylococcus aureus biofilms. npj Biofilms and Microbiomes 7:39. DOI: 10.1038/s41522-021-00208-5.

Duplessis C., Stockelman M., Hamilton T., Merril G., Brownstein M., Bishop-Lilly K., Schooley R., Henry M., Horne B., Sisson B. (2019) A case series of emergency investigational new drug applications for bacteriophages treating recalcitrant multi-drug resistant bacterial infections: confirmed safety and a signal of efficacy. J. Intensive Crit. Care 5.

El-Atrees D.M., El-Kased R.F., Abbas A.M., Yassien M.A. (2022) Characterization and anti-biofilm activity of bacteriophages against urinary tract Enterococcus faecalis isolates. Scientific Reports 12:13048. DOI: 10.1038/s41598-022-17275-z.

Ellis E.L., Delbruck M. (1939) The growth of bacteriophage. J The Journal of general physiology 22:365-384.

Farhadi M., Ahanjan M., Goli H.R., Haghshenas M.R., Gholami M. (2021) High frequency of multidrug-resistant (MDR) Klebsiella pneumoniae harboring several β-lactamase and integron genes collected from several hospitals in the north of Iran. Annals of Clinical Microbiology and Antimicrobials 20:70. DOI: 10.1186/s12941-021-00476-1.

Feng Y.Y., Ong S.L., Hu J.Y., Tan X.L., Ng W.J. (2003) Effects of pH and temperature on the survival of coliphages MS2 and Qbeta. J Ind Microbiol Biotechnol 30:549-52. DOI: 10.1007/s10295-003-0080-y.

Fernández L., Hancock R.E. (2012) Adaptive and mutational resistance: role of porins and efflux pumps in drug resistance. Clin Microbiol Rev 25:661-81. DOI: 10.1128/cmr.00043-12.

Ferry T., Kolenda C., Laurent F., Leboucher G., Merabischvilli M., Djebara S., Gustave C.-A., Perpoint T., Barrey C., Pirnay J.-P. (2022) Personalized bacteriophage therapy to treat pandrug-resistant spinal Pseudomonas aeruginosa infection. J Nature communications 13:1-6.

Gallaher T.K., Wu S., Webster P., Aguilera R. (2006) Identification of biofilm proteins in non-typeable Haemophilus Influenzae. BMC Microbiol 6:65. DOI: 10.1186/1471-2180-6-65.

Gomes L.C., Mergulhao F.J. (2017) SEM Analysis of Surface Impact on Biofilm Antibiotic Treatment. Scanning 2017:2960194. DOI: 10.1155/2017/2960194.

Greenhalgh D.G. (2019) Management of Burns. N Engl J Med 380:2349-2359. DOI: 10.1056/NEJMra1807442.

Gudlavalleti B.S., Phung T., Barton C.L., Becker A., Graul B.L., Griffin J.T., Hays C.J., Horn B., Liang D.R., Rutledge L.M., Szalanczy A.M., Gaffney B.L., King R.A., Rinehart C.A., Staples A.K., Stewart A.A., Nydam M.L., O'Quin K.E. (2020) Whole genome sequencing identifies an allele responsible for clear vs. turbid plaque morphology in a Mycobacteriophage. BMC Microbiology 20:148. DOI: 10.1186/s12866-020-01833-4.

Gunasekaran K.J.C.M.I. (2022) Antimicrobial resistance in India–"A silent pandemic within the pandemic". J Current Medical Issues 20:123-124. DOI: 10.4103/cmi.cmi_47_22.

Guo X., Liu S., Zhou X., Hu H., Zhang K., Du X., Peng X., Ren B., Cheng L., Li M. (2019) Effect of D-cysteine on dual-species biofilms of Streptococcus mutans

and Streptococcus sanguinis. Sci Rep 9:6689. DOI: 10.1038/s41598-019-43081-1.

Hamza A., Perveen S., Abbas Z., Rehman S.U. (2016) The Lytic SA Phage Demonstrate Bactericidal Activity against Mastitis Causing Staphylococcus aureus 11:39-45. DOI: doi:10.1515/biol-2016-0005.

Han J.E., Kim J.H., Hwang S.Y., Choresca C.H., Jr., Shin S.P., Jun J.W., Chai J.Y., Park Y.H., Park S.C. (2013) Isolation and characterization of a Myoviridae bacteriophage against Staphylococcus aureus isolated from dairy cows with mastitis. Res Vet Sci 95:758-63. DOI: 10.1016/j.rvsc.2013.06.001.

Hong S.C., Yoo S.Y., Kim H., Lee J. (2017) Chitosan-Based Multifunctional Platforms for Local Delivery of Therapeutics. Mar Drugs 15. DOI: 10.3390/md15030060.

Hyman P. (2019) Phages for Phage Therapy: Isolation, Characterization, and Host Range Breadth. Pharmaceuticals (Basel) 12. DOI: 10.3390/ph12010035.

Ilomuanya M.O., Enwuru N.V., Adenokun E., Fatunmbi A., Adeluola A., Igwilo C.I. (2022) Chitosan-Based Microparticle Encapsulated Acinetobacter baumannii Phage Cocktail in Hydrogel Matrix for the Management of Multidrug Resistant Chronic Wound Infection. Turk J Pharm Sci 19:187-195. DOI: 10.4274/tjps.galenos.2021.72547.

Jain H., Bairagi A., Srivastava S., Singh S.B., Mehra N.K. (2020) Recent advances in the development of microparticles for pulmonary administration. Drug Discovery Today 25:1865-1872. DOI: https://doi.org/10.1016/j.drudis.2020.07.018.

Jamaledin R., Sartorius R., Di Natale C., Onesto V., Manco R., Mollo V., Vecchione R., De Berardinis P., Netti P.A. (2023) PLGA microparticle formulations for tunable delivery of a nano-engineered filamentous bacteriophage-based vaccine: in vitro and in silico-supported approach. Journal of Nanostructure in Chemistry. DOI: 10.1007/s40097-022-00519-9.

Jassim K.A., Habib K.A., Hussien I.A. (2012) Bacterial colonization of burn wounds. Baghdad Science Journal 9:623-631.

Jończyk E., Kłak M., Międzybrodzki R., Górski A. (2011a) The influence of external factors on bacteriophages--review. Folia Microbiol (Praha) 56:191-200. DOI: 10.1007/s12223-011-0039-8.

Jończyk E., Kłak M., Międzybrodzki R., Górski A. (2011b) The influence of external factors on bacteriophages—review. Folia Microbiologica 56:191-200. DOI: 10.1007/s12223-011-0039-8.

Jurczak-Kurek A., Gąsior T., Nejman-Faleńczyk B., Bloch S., Dydecka A., Topka G., Necel A., Jakubowska-Deredas M., Narajczyk M., Richert M., Mieszkowska A., Wróbel B., Węgrzyn G., Węgrzyn A. (2016) Biodiversity of bacteriophages: morphological and biological properties of a large group of phages isolated from urban sewage. Scientific Reports 6:34338. DOI: 10.1038/srep34338.

Kalelkar P.P., Moustafa D.A., Riddick M., Goldberg J.B., McCarty N.A., García A.J. (2022) Bacteriophage-Loaded Poly(lactic-co-glycolic acid) Microparticles Mitigate Staphylococcus aureus Infection and Cocultures of Staphylococcus aureus and Pseudomonas aeruginosa. Adv Healthc Mater 11:e2102539. DOI: 10.1002/adhm.202102539.

Karygianni L., Ren Z., Koo H., Thurnheer T. (2020) Biofilm Matrixome: Extracellular Components in Structured Microbial Communities. Trends Microbiol 28:668-681. DOI: 10.1016/j.tim.2020.03.016.

Kaur S., Kumari A., Kumari Negi A., Galav V., Thakur S., Agrawal M., Sharma V. (2021) Nanotechnology Based Approaches in Phage Therapy: Overcoming the Pharmacological Barriers. Front Pharmacol 12:699054. DOI: 10.3389/fphar.2021.699054.

Ke C.-L., Deng F.-S., Chuang C.-Y., Lin C.-H. (2021) Antimicrobial Actions and Applications of Chitosan 13:904.

Khan R.N., Radhakrishna K., Rautji R., Chaturvedi Y., Dhokia G. (2020) Profile of deaths due to burn injuries: A retrospective study of eight years in a tertiary care centre in Western Maharashtra. J IP International Journal of Forensic Medicine and Toxicological Sciences 4:137-139. DOI: https://doi.org/10.18231/j.ijfmts.2019.031.

Khawaja K.A., Abbas Z., Rehman S.U. (2016) Isolation and characterization of lytic phages TSE1-3 against Enterobacter cloacae. J Open Life Sciences 11:287-292.

Kim S., Jo A., Ahn J.J.I.J.o.F.S., Technology. (2015) Application of chitosan–alginate microspheres for the sustained release of bacteriophage in simulated gastrointestinal conditions 50:913-918.

Kim T., Zhang Q., Li J., Zhang L., Jokerst J.V. (2018) A Gold/Silver Hybrid Nanoparticle for Treatment and Photoacoustic Imaging of Bacterial Infection. ACS Nano 12:5615-5625. DOI: 10.1021/acsnano.8b01362.

King A.M.Q., Adams M.J., Carstens E.B., Lefkowitz E.J. (2012) Corticoviridae, Virus Taxonomy, Elsevier, San Diego. pp. 179-182.

Knoll B.M., Mylonakis E. (2014) Antibacterial bioagents based on principles of bacteriophage biology: an overview. Clinical infectious diseases 58:528-534.

Kropinski A.M., Mazzocco A., Waddell T.E., Lingohr E., Johnson R.P. (2009) Enumeration of bacteriophages by double agar overlay plaque assay. Methods Mol Biol 501:69-76. DOI: 10.1007/978-1-60327-164-6_7.

Kumar M., Mahmood S., Mandal U.K. (2022) An Updated Account on Formulations and Strategies for the Treatment of Burn Infection - A Review. Curr Pharm Des 28:1480-1492. DOI: 10.2174/1381612828666220519145859.

Kumar Mehata A., Bharti S., Singh P., Viswanadh M.K., Kumari L., Agrawal P., Singh S., Koch B., Muthu M.S. (2019) Trastuzumab decorated TPGS-g-chitosan nanoparticles for targeted breast cancer therapy. Colloids Surf B Biointerfaces 173:366-377. DOI: 10.1016/j.colsurfb.2018.10.007.

Kumari S., Harjai K., Chhibber S. (2011) Bacteriophage versus antimicrobial agents for the treatment of murine burn wound infection caused by Klebsiella pneumoniae B5055. J Med Microbiol 60:205-210. DOI: 10.1099/jmm.0.018580-0.

Kutateladze M. (2015) Experience of the Eliava Institute in bacteriophage therapy. Virologica Sinica 30:80-81.

Lan P., Jiang Y., Zhou J., Yu Y. (2021) A global perspective on the convergence of hypervirulence and carbapenem resistance in Klebsiella pneumoniae. J Glob Antimicrob Resist 25:26-34. DOI: 10.1016/j.jgar.2021.02.020.

Lashtoo Aghaee B., Alikhani M.Y., van Leeuwen W.B., Mojtahedi A., Kazemi S., Karami P.J.I.J.o.M.M. (2022) Conventional Treatment of Burn Wound Infections versus Phage Therapy. Iranian Journal of Medical Microbiology 16:186-196.

Lattif A.A., Mukherjee P.K., Chandra J., Roth M.R., Welti R., Rouabhia M., Ghannoum M.A. (2011) Lipidomics of Candida albicans biofilms reveals phase-dependent production of phospholipid molecular classes and role for lipid rafts in biofilm formation. Microbiology (Reading) 157:3232-3242. DOI: 10.1099/mic.0.051086-0.

Letkiewicz S., Międzybrodzki R., Fortuna W., Weber-Dąbrowska B., Górski A. (2009) Eradication of Enterococcus faecalis by phage therapy in chronic bacterial prostatitis—case report. Folia microbiologica 54:457.

Leung V., Groves L., Szewczyk A., Hosseinidoust Z., Filipe C.D.M. (2018) Long-Term Antimicrobial Activity of Phage–Sugar Glasses is Closely Tied to the Processing Conditions. ACS Omega 3:18295-18303. DOI: 10.1021/acsomega.8b02679.

Li C.W., Wang Q., Li J., Hu M., Shi S.J., Li Z.W., Wu G.L., Cui H.H., Li Y.Y., Zhang Q., Yu X.H., Lu L.C. (2016) Silver nanoparticles/chitosan oligosaccharide/poly(vinyl alcohol) nanofiber promotes wound healing by activating TGFβ1/Smad signaling pathway. Int J Nanomedicine 11:373-86. DOI: 10.2147/ijn.S91975.

Li X., Kong X., Shi S., Zheng X., Guo G., Wei Y., Qian Z. (2008) Preparation of alginate coated chitosan microparticles for vaccine delivery. BMC Biotechnology 8:89. DOI: 10.1186/1472-6750-8-89.

Lin D.M., Koskella B., Lin H.C. (2017) Phage therapy: An alternative to antibiotics in the age of multi-drug resistance. World J Gastrointest Pharmacol Ther 8:162-173. DOI: 10.4292/wjgpt.v8.i3.162.

Lin X., Shen Y., Wang L. (2021) Multi-Scale Photoacoustic Assessment of Wound Healing Using Chitosan–Graphene Oxide Hemostatic Sponge 11:2879.

Liu H., Wang C., Li C., Qin Y., Wang Z., Yang F., Li Z., Wang J. (2018) A functional chitosan-based hydrogel as a wound dressing and drug delivery system in the treatment of wound healing. RSC Adv 8:7533-7549. DOI: 10.1039/c7ra13510f.

Liu Y., She P., Xu L., Chen L., Li Y., Liu S., Li Z., Hussain Z., Wu Y. (2021) Antimicrobial, Antibiofilm, and Anti-persister Activities of Penfluridol Against Staphylococcus aureus. Front Microbiol 12:727692. DOI: 10.3389/fmicb.2021.727692.

Loganathan A., Manohar P., Eniyan K., VinodKumar C.S., Leptihn S., Nachimuthu R. (2021) Phage therapy as a revolutionary medicine against Gram-positive bacterial infections. Beni Suef Univ J Basic Appl Sci 10:49. DOI: 10.1186/s43088-021-00141-8.

Loh B., Gondil V.S., Manohar P., Khan F.M., Yang H., Leptihn S. (2021) Encapsulation and Delivery of Therapeutic Phages. Appl Environ Microbiol 87. DOI: 10.1128/aem.01979-20.

Longo F., Vuotto C., Donelli G. (2014) Biofilm formation in Acinetobacter baumannii. New Microbiol 37:119-27.

Luo J., Xie L., Liu M., Li Q., Wang P., Luo C. (2022) Bactericidal Synergism between Phage YC#06 and Antibiotics: a Combination Strategy to Target Multidrug-

Resistant Acinetobacter baumannii In Vitro and In Vivo. Microbiol Spectr 10:e0009622. DOI: 10.1128/spectrum.00096-22.

Luong T., Salabarria A.C., Edwards R.A., Roach D.R. (2020) Standardized bacteriophage purification for personalized phage therapy. Nat Protoc 15:2867-2890. DOI: 10.1038/s41596-020-0346-0.

Ma Y., Pacan J.C., Wang Q., Xu Y., Huang X., Korenevsky A., Sabour P.M. (2008a) Microencapsulation of bacteriophage felix O1 into chitosan-alginate microspheres for oral delivery. Applied and environmental microbiology 74:4799-4805. DOI: 10.1128/AEM.00246-08.

Ma Y., Pacan J.C., Wang Q., Xu Y., Huang X., Korenevsky A., Sabour P.M. (2008b) Microencapsulation of bacteriophage felix O1 into chitosan-alginate microspheres for oral delivery. Appl Environ Microbiol 74:4799-805. DOI: 10.1128/aem.00246-08.

MacWilliams M.P., Liao M.K. (2006) Luria broth (LB) and Luria agar (LA) media and their uses protocol. J ASM 2006.

Mandal S.M., Roy A., Ghosh A.K., Hazra T.K., Basak A., Franco O.L. (2014) Challenges and future prospects of antibiotic therapy: from peptides to phages utilization. Front Pharmacol 5:105. DOI: 10.3389/fphar.2014.00105.

Manohar P., Madurantakam Royam M., Loh B., Bozdogan B., Nachimuthu R., Leptihn S. (2022) Synergistic Effects of Phage–Antibiotic Combinations against Citrobacter amalonaticus. ACS Infectious Diseases 8:59-65. DOI: 10.1021/acsinfecdis.1c00117.

Mantri Y., Tsujimoto J., Donovan B., Fernandes C.C., Garimella P.S., Penny W.F., Anderson C.A., Jokerst J.V. (2022) Photoacoustic monitoring of angiogenesis predicts response to therapy in healing wounds. Wound Repair Regen 30:258-267. DOI: 10.1111/wrr.12992.

Markiewicz-Gospodarek A., Kozioł M., Tobiasz M., Baj J., Radzikowska-Büchner E., Przekora A. (2022) Burn Wound Healing: Clinical Complications, Medical Care, Treatment, and Dressing Types: The Current State of Knowledge for Clinical Practice. Int. J. Environ. Res. 19:1338. DOI: https://doi.org/10.3390/ijerph19031338.

Martins A.F., de Oliveira D.M., Pereira A.G.B., Rubira A.F., Muniz E.C. (2012) Chitosan/TPP microparticles obtained by microemulsion method applied in controlled release of heparin. International Journal of Biological Macromolecules 51:1127-1133. DOI: https://doi.org/10.1016/j.ijbiomac.2012.08.032.

Masson-Meyers D.S., Andrade T.A.M., Caetano G.F., Guimaraes F.R., Leite M.N., Leite S.N., Frade M.A.C. (2020) Experimental models and methods for cutaneous wound healing assessment. Int J Exp Pathol 101:21-37. DOI: 10.1111/iep.12346.

Mathew S. (2016) A need for careful consideration of bacteriophage therapy. The Indian journal of medical research 144:482.

Matters G.H. (2022) The paradox of antimicrobial resistance in India. National Institutes of Health-Fogarty International Center (NIH -FIC) 21:3.

Mayhall C.G. (2003) The epidemiology of burn wound infections: then and now. Clin Infect Dis 37:543-50. DOI: 10.1086/376993.

McCallin S., Sacher J., Zheng J., Chan B. (2019) Current state of compassionate phage therapy. Viruses 11: 343.

Meng Q., Sun Y., Cong H., Hu H., Xu F.-J. (2021) An overview of chitosan and its application in infectious diseases. Drug Delivery and Translational Research 11:1340-1351. DOI: 10.1007/s13346-021-00913-w.

Mohammadian F., Rahmani H.K., Bidarian B., Khoramian B. (2022) Isolation and evaluation of the efficacy of bacteriophages against multidrug-resistant (MDR), methicillin-resistant (MRSA) and biofilm-producing strains of Staphylococcus aureus recovered from bovine mastitis. BMC Veterinary Research 18:406. DOI: 10.1186/s12917-022-03501-3.

Montanaro L., Poggi A., Visai L., Ravaioli S., Campoccia D., Speziale P., Arciola C.R. (2011) Extracellular DNA in biofilms. Int J Artif Organs 34:824-31. DOI: 10.5301/ijao.5000051.

Munita J.M., Arias C.A. (2016) Mechanisms of Antibiotic Resistance. Microbiol Spectr 4. DOI: 10.1128/microbiolspec.VMBF-0016-2015.

Murray C.J., Ikuta K.S., Sharara F., Swetschinski L., Aguilar G.R., Gray A., Han C., Bisignano C., Rao P., Wool E. (2022) Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. J The Lancet 399:629-655.

Nassar M.S.M., Hazzah W.A., Bakr W.M.K. (2019) Evaluation of antibiotic susceptibility test results: how guilty a laboratory could be? J Egypt Public Health Assoc 94:4. DOI: 10.1186/s42506-018-0006-1.

Nasser S., Mabrouk A., Maher A. (2003) Colonization of burn wounds in Ain Shams University burn unit. Burns 29:229-233.

Ogawara H. (2015) Penicillin-binding proteins in Actinobacteria. The Journal of Antibiotics 68:223-245. DOI: 10.1038/ja.2014.148.

Olofsson L., Ankarloo J., Andersson P.O., Nicholls I.A. (2001) Filamentous bacteriophage stability in non-aqueous media. Chemistry & Biology 8:661-671. DOI: https://doi.org/10.1016/S1074-5521(01)00041-2.

Pallavi B., Puneeth T.G., Shekar M., Girisha S.K. (2021) Isolation, characterization and genomic analysis of vB-AhyM-AP1, a lytic bacteriophage infecting Aeromonas hydrophila. Journal of Applied Microbiology 131:695-705. DOI: 10.1111/jam.14997 %J Journal of Applied Microbiology.

Pan Y., Ren X., Wang S., Li X., Luo X., Yin Z. (2017) Annexin V-Conjugated Mixed Micelles as a Potential Drug Delivery System for Targeted Thrombolysis. Biomacromolecules 18:865-876. DOI: 10.1021/acs.biomac.6b01756.

Parsek M.R., Val D.L., Hanzelka B.L., Cronan J.E., Jr., Greenberg E.P. (1999) Acyl homoserine-lactone quorum-sensing signal generation. Proc Natl Acad Sci U S A 96:4360-5. DOI: 10.1073/pnas.96.8.4360.

Patel K.K., Surekha D.B., Tripathi M., Anjum M.M., Muthu M.S., Tilak R., Agrawal A.K., Singh S. (2019) Antibiofilm Potential of Silver Sulfadiazine-Loaded Nanoparticle Formulations: A Study on the Effect of DNase-I on Microbial Biofilm and Wound Healing Activity. Molecular Pharmaceutics 16:3916-3925. DOI: 10.1021/acs.molpharmaceut.9b00527.

Paterson D.L., Bonomo R.A. (2005) Extended-spectrum beta-lactamases: a clinical update. Clin Microbiol Rev 18:657-86. DOI: 10.1128/CMR.18.4.657-686.2005.

Peterson E., Kaur P. (2018) Antibiotic Resistance Mechanisms in Bacteria: Relationships Between Resistance Determinants of Antibiotic Producers, Environmental Bacteria, and Clinical Pathogens. Front Microbiol 9:2928. DOI: 10.3389/fmicb.2018.02928.

Petsong K., Benjakul S., Vongkamjan K. (2021) Optimization of wall material for phage encapsulation via freeze-drying and antimicrobial efficacy of microencapsulated phage against Salmonella. J Food Sci Technol 58:1937-1946. DOI: 10.1007/s13197-020-04705-x.

Plota M., Sazakli E., Giormezis N., Gkartziou F., Kolonitsiou F., Leotsinidis M., Antimisiaris S.G., Spiliopoulou I. (2021) In Vitro Anti-Biofilm Activity of Bacteriophage K (ATCC 19685-B1) and Daptomycin against Staphylococci. Microorganisms 9. DOI: 10.3390/microorganisms9091853.

Podlacha M., Grabowski Ł., Kosznik-Kawśnicka K., Zdrojewska K., Stasiłojć M., Węgrzyn G., Węgrzyn A. (2021) Interactions of Bacteriophages with Animal and Human Organisms-Safety Issues in the Light of Phage Therapy. Int J Mol Sci 22. DOI: 10.3390/ijms22168937.

Powell L.C., Pritchard M.F., Ferguson E.L., Powell K.A., Patel S.U., Rye P.D., Sakellakou S.-M., Buurma N.J., Brilliant C.D., Copping J.M., Menzies G.E., Lewis P.D., Hill K.E., Thomas D.W. (2018) Targeted disruption of the extracellular polymeric network of Pseudomonas aeruginosa biofilms by alginate oligosaccharides. npj Biofilms and Microbiomes 4:13. DOI: 10.1038/s41522-018-0056-3.

Pradeep A., Ramasamy S., Veniemilda J., Kumar C.V. (2022) Effect of pH & temperature variations on phage stability - A crucial prerequisite for successful phage therapy. IJPSR 13:5178-5182.

Prestinaci F., Pezzotti P., Pantosti A. (2015) Antimicrobial resistance: a global multifaceted phenomenon. Pathog Glob Health 109:309-18. DOI: 10.1179/2047773215y.0000000030.

Proniuk S., Blanchard J. (2002) Anhydrous Carbopol® Polymer Gels for the Topical Delivery of Oxygen/Water Sensitive Compounds. Pharmaceutical Development and Technology 7:249-255. DOI: 10.1081/PDT-120003492.

Puapermpoonsiri U., Spencer J., van der Walle C.F. (2009) A freeze-dried formulation of bacteriophage encapsulated in biodegradable microspheres. Eur J Pharm Biopharm 72:26-33. DOI: 10.1016/j.ejpb.2008.12.001.

Puthia M., Butrym M., Petrlova J., Strömdahl A.C., Andersson M., Kjellström S., Schmidtchen A. (2020) A dual-action peptide-containing hydrogel targets wound infection and inflammation. Sci Transl Med 12. DOI: 10.1126/scitranslmed.aax6601.

Quan K., Hou J., Zhang Z., Ren Y., Peterson B.W., Flemming H.C., Mayer C., Busscher H.J., van der Mei H.C. (2022) Water in bacterial biofilms: pores and channels, storage and transport functions. Crit Rev Microbiol 48:283-302. DOI: 10.1080/1040841x.2021.1962802.

Rahimzadeh G., Saeedi M., Moosazadeh M., Hashemi S.M.H., Babaei A., Rezai M.S., Kamel K., Asare-Addo K., Nokhodchi A. (2021) Encapsulation of bacteriophage

cocktail into chitosan for the treatment of bacterial diarrhea. Scientific Reports 11:15603. DOI: 10.1038/s41598-021-95132-1.

Ramesh N., Archana L., Madurantakam Royam M., Manohar P., Eniyan K. (2019) Effect of various bacteriological media on the plaque morphology of Staphylococcus and Vibrio phages. Access Microbiol 1:e000036. DOI: 10.1099/acmi.0.000036.

Ramirez K., Cazarez-Montoya C., Lopez-Moreno H.S., Castro-Del Campo N. (2018) Bacteriophage cocktail for biocontrol of Escherichia coli O157:H7: Stability and potential allergenicity study. PLoS One 13:e0195023. DOI: 10.1371/journal.pone.0195023.

Rezk N., Abdelsattar A.S., Elzoghby D., Agwa M.M., Abdelmoteleb M., Aly R.G., Fayez M.S., Essam K., Zaki B.M., El-Shibiny A. (2022) Bacteriophage as a potential therapy to control antibiotic-resistant Pseudomonas aeruginosa infection through topical application onto a full-thickness wound in a rat model. Journal of Genetic Engineering and Biotechnology 20:133. DOI: 10.1186/s43141-022-00409-1.

Rivera Aguayo P., Bruna Larenas T., Alarcón Godoy C., Cayupe Rivas B., González-Casanova J., Rojas-Gómez D., Caro Fuentes N. (2020) Antimicrobial and Antibiofilm Capacity of Chitosan Nanoparticles against Wild Type Strain of Pseudomonas sp. Isolated from Milk of Cows Diagnosed with Bovine Mastitis. Antibiotics (Basel) 9. DOI: 10.3390/antibiotics9090551.

Rodríguez-Melcón C., Alonso-Calleja C., García-Fernández C., Carballo J., Capita R. (2021) Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) for Twelve Antimicrobials (Biocides and Antibiotics) in

Eight Strains of Listeria monocytogenes. Biology (Basel) 11. DOI: 10.3390/biology11010046.

Rose T., Verbeken G., De Vos D., Merabishvili M., Vaneechoutte M., Lavigne R., Jennes S., Zizi M., Pirnay J.-P. (2014) Experimental phage therapy of burn wound infection: difficult first steps. International journal of burns and trauma 4:66.

Rotman S.G., Post V., Foster A.L., Lavigne R., Wagemans J., Trampuz A., Moreno M.G., Metsemakers W.J., Grijpma D.W., Richards R.G., Eglin D., Moriarty T.F. (2023) Alginate chitosan microbeads and thermos-responsive hyaluronic acid hydrogel for phage delivery. Journal of Drug Delivery Science and Technology 79:103991. DOI: https://doi.org/10.1016/j.jddst.2022.103991.

Roy R., Tiwari M., Donelli G., Tiwari V.J.V. (2018) Strategies for combating bacterial biofilms: A focus on anti-biofilm agents and their mechanisms of action 9:522-554.

Ryder C., Byrd M., Wozniak D.J. (2007) Role of polysaccharides in Pseudomonas aeruginosa biofilm development. Curr Opin Microbiol 10:644-8. DOI: 10.1016/j.mib.2007.09.010.

Saleh N., Awada S., Awwad R., Jibai S., Arfoul C., Zaiter L., Dib W., Salameh P. (2015) Evaluation of antibiotic prescription in the Lebanese community: a pilot study. Infect Ecol Epidemiol 5:27094. DOI: 10.3402/iee.v5.27094.

Salyers A., Shoemaker N.B. (2006) Reservoirs of antibiotic resistance genes. Animal biotechnology 17:137-146.

Santos Costa S., Viveiros M., Rosato A.E., Melo-Cristino J., Couto I. (2015) Impact of efflux in the development of multidrug resistance phenotypes in Staphylococcus aureus. BMC Microbiol 15:232. DOI: 10.1186/s12866-015-0572-8.

Sareen R., Kapil M., Gupta G.N. (2018) Incubation and its effect on Leishman stain. J Lab Physicians 10:357-361. DOI: 10.4103/jlp.Jlp_154_17.

Sartelli M., Coccolini F., Kluger Y., Agastra E., Abu-Zidan F.M., Abbas A.E.S., Ansaloni L., Adesunkanmi A.K., Atanasov B., Augustin G., Bala M., Baraket O., Baral S., Biffl W.L., Boermeester M.A., Ceresoli M., Cerutti E., Chiara O., Cicuttin E., Chiarugi M., Coimbra R., Colak E., Corsi D., Cortese F., Cui Y., Damaskos D., De' Angelis N., Delibegovic S., Demetrashvili Z., De Simone B., de Jonge S.W., Dhingra S., Di Bella S., Di Marzo F., Di Saverio S., Dogjani A., Duane T.M., Enani M.A., Fugazzola P., Galante J.M., Gachabayov M., Ghnnam W., Gkiokas G., Gomes C.A., Griffiths E.A., Hardcastle T.C., Hecker A., Herzog T., Kabir S.M.U., Karamarkovic A., Khokha V., Kim P.K., Kim J.I., Kirkpatrick A.W., Kong V., Koshy R.M., Kryvoruchko I.A., Inaba K., Isik A., Iskandar K., Ivatury R., Labricciosa F.M., Lee Y.Y., Leppäniemi A., Litvin A., Luppi D., Machain G.M., Maier R.V., Marinis A., Marmorale C., Marwah S., Mesina C., Moore E.E., Moore F.A., Negoi I., Olaoye I., Ordoñez C.A., Ouadii M., Peitzman A.B., Perrone G., Pikoulis M., Pintar T., Pipitone G., Podda M., Raşa K., Ribeiro J., Rodrigues G., Rubio-Perez I., Sall I., Sato N., Sawyer R.G., Segovia Lohse H., Sganga G., Shelat V.G., Stephens I., Sugrue M., Tarasconi A., Tochie J.N., Tolonen M., Tomadze G., *et al.* (2021) WSES/GAIS/SIS-E/WSIS/AAST global clinical pathways for patients with intra-abdominal infections. World J Emerg Surg 16:49. DOI: 10.1186/s13017-021-00387-8.

Schooley R.T., Biswas B., Gill J.J., Hernandez-Morales A., Lancaster J., Lessor L., Barr J.J., Reed S.L., Rohwer F., Benler S., Segall A.M., Taplitz R., Smith D.M., Kerr K., Kumaraswamy M., Nizet V., Lin L., McCauley M.D., Strathdee S.A., Benson C.A., Pope R.K., Leroux B.M., Picel A.C., Mateczun A.J., Cilwa K.E., Regeimbal J.M., Estrella L.A., Wolfe D.M., Henry M.S., Quinones J., Salka S., Bishop-Lilly K.A., Young R., Hamilton T. (2017) Development and Use of Personalized Bacteriophage-Based Therapeutic Cocktails To Treat a Patient with a Disseminated Resistant Acinetobacter baumannii Infection. Antimicrob Agents Chemother 61. DOI: 10.1128/aac.00954-17.

Serra R., Grande R., Butrico L., Rossi A., Settimio U.F., Caroleo B., Amato B., Gallelli L., de Franciscis S. (2015) Chronic wound infections: the role of Pseudomonas aeruginosa and Staphylococcus aureus. Expert Review of Anti-infective Therapy 13:605-613. DOI: 10.1586/14787210.2015.1023291.

Shariati A., Moradabadi A., Ghaznavi-Rad E., Dadmanesh M., Komijani M., Nojoomi F. (2021) Investigation into antibacterial and wound healing properties of platelets lysate against Acinetobacter baumannii and Klebsiella pneumoniae burn wound infections. Ann Clin Microbiol Antimicrob 20:40. DOI: 10.1186/s12941-021-00442-x.

Sharma S., Datta S., Chatterjee S., Dutta M., Samanta J., Vairale M.G., Gupta R., Veer V., Dwivedi S.K. (2021) Isolation and characterization of a lytic bacteriophage against Pseudomonas aeruginosa. Scientific Reports 11:19393. DOI: 10.1038/s41598-021-98457-z.

Short F.L., Murdoch S.L., Ryan R.P. (2014) Polybacterial human disease: the ills of social networking. Trends Microbiol 22:508-16. DOI: 10.1016/j.tim.2014.05.007.

Silva Batalha L., Pardini Gontijo M.T., Vianna Novaes de Carvalho Teixeira A., Meireles Gouvêa Boggione D., Soto Lopez M.E., Renon Eller M., Santos Mendonça R.C. (2021) Encapsulation in alginate-polymers improves stability and allows controlled release of the UFV-AREG1 bacteriophage. Food Res Int 139:109947. DOI: 10.1016/j.foodres.2020.109947.

Silva Y.J., Costa L., Pereira C., Cunha Â., Calado R., Gomes N.C., Almeida A. (2014) Influence of environmental variables in the efficiency of phage therapy in aquaculture. Microb Biotechnol 7:401-13. DOI: 10.1111/1751-7915.12090.

Singh A., Singh A.N., Rathor N., Chaudhry R., Singh S.K., Nath G. (2022a) Evaluation of Bacteriophage Cocktail on Septicemia Caused by Colistin-Resistant Klebsiella pneumoniae in Mice Model. Front Pharmacol 13:778676. DOI: 10.3389/fphar.2022.778676.

Singh A., Singh A.N., Rathor N., Chaudhry R., Singh S.K., Nath G. (2022b) Evaluation of Bacteriophage Cocktail on Septicemia Caused by Colistin-Resistant Klebsiella pneumoniae in Mice Model. Frontiers in Pharmacology 13. DOI: 10.3389/fphar.2022.778676.

Slopek S., Durlakowa I., Weber-Dabrowska B., Kucharewicz-Krukowska A., Dabrowski M., Bisikiewicz R. (1983) Results of bacteriophage treatment of suppurative bacterial infections. I. General evaluation of the results. Arch Immunol Ther Exp (Warsz) 31:267-91.

Sreekumar S., Goycoolea F.M., Moerschbacher B.M., Rivera-Rodriguez G.R. (2018) Parameters influencing the size of chitosan-TPP nano- and microparticles. Scientific Reports 8:4695. DOI: 10.1038/s41598-018-23064-4.

Suda T., Hanawa T., Tanaka M., Tanji Y., Miyanaga K., Hasegawa-Ishii S., Shirato K., Kizaki T., Matsuda T. (2022) Modification of the immune response by bacteriophages alters methicillin-resistant Staphylococcus aureus infection. Scientific Reports 12:15656. DOI: 10.1038/s41598-022-19922-x.

Sun D., Jeannot K., Xiao Y., Knapp C.W. (2019) Horizontal Gene Transfer Mediated Bacterial Antibiotic Resistance. Front. Microbiol. 10. DOI: 10.3389/fmicb.2019.01933.

Sun F., Qu F., Ling Y., Mao P., Xia P., Chen H., Zhou D.J.F.M. (2013) Biofilm-associated infections: antibiotic resistance and novel therapeutic strategies 8:877-886.

Tabare E., Dauchot T., Cochez C., Glonti T., Antoine C., Laforêt F., Pirnay J.-P., Delcenserie V., Thiry D., Goole J. (2023) Eudragit® FS Microparticles Containing Bacteriophages, Prepared by Spray-Drying for Oral Administration 15:1602.

Taneja N., Sharma M. (2019) Antimicrobial resistance in the environment: The Indian scenario. Indian J Med Res 149:119-128. DOI: 10.4103/ijmr.IJMR_331_18.

Teng F., Xiong X., Zhang S., Li G., Wang R., Zhang L., Wang X., Zhou H., Li J., Li Y., Jiang Y., Cui W., Tang L., Wang L., Qiao X. (2022) Efficacy Assessment of Phage Therapy in Treating Staphylococcus aureus-Induced Mastitis in Mice. Viruses 14. DOI: 10.3390/v14030620.

Titze I., Lehnherr T., Lehnherr H., Krömker V. (2020) Efficacy of Bacteriophages Against Staphylococcus aureus Isolates from Bovine Mastitis 13:35.

Trøstrup H., Lerche C.J., Christophersen L.J., Thomsen K., Jensen P., Hougen H.P., Høiby N., Moser C. (2017) Chronic Pseudomonas aeruginosa biofilm infection impairs murine S100A8/A9 and neutrophil effector cytokines-implications for delayed wound closure? Pathog Dis 75. DOI: 10.1093/femspd/ftx068.

Vandenheuvel D., Meeus J., Lavigne R., Van den Mooter G. (2014) Instability of bacteriophages in spray-dried trehalose powders is caused by crystallization of the matrix. International Journal of Pharmaceutics 472:202-205. DOI: https://doi.org/10.1016/j.ijpharm.2014.06.026.

Vautor E., Abadie G., Pont A., Thiery R. (2008) Evaluation of the presence of the bap gene in Staphylococcus aureus isolates recovered from human and animals species. Vet Microbiol 127:407-11. DOI: 10.1016/j.vetmic.2007.08.018.

Vitzilaiou E., Liang Y., Castro-Mejía J.L., Franz C.M.A.P., Neve H., Vogensen F.K., Knøchel S. (2022) UV tolerance of Lactococcus lactis 936-type phages: Impact of wavelength, matrix, and pH. International Journal of Food Microbiology 378:109824. DOI: https://doi.org/10.1016/j.ijfoodmicro.2022.109824.

Warby R., Maani C.V. (2019) Burn classification.

Watts G. (2017) Phage therapy: revival of the bygone antimicrobial. Lancet 390:2539-2540. DOI: 10.1016/s0140-6736(17)33249-x.

Wdowiak M., Paczesny J., Raza S. (2022) Enhancing the Stability of Bacteriophages Using Physical, Chemical, and Nano-Based Approaches: A Review. Pharmaceutics 14. DOI: 10.3390/pharmaceutics14091936.

Weber-Dąbrowska B., Mulczyk M., Górski A. (2001) Bacteriophage therapy of bacterial infections: an update of our institute's experience, Inflammation, Springer. pp. 201-209.

Winkelhausen E., Velickova E., Amartey S.A., Kuzmanova S. (2010) Ethanol Production Using Immobilized Saccharomyces cerevisiae in Lyophilized Cellulose Gel. Applied Biochemistry and Biotechnology 162:2214-2220. DOI: 10.1007/s12010-010-8995-z.

Wu N., Chen L.-K., Zhu T.J.C.O.i.V. (2022) Phage therapy for secondary bacterial infections with COVID-19 52:9-14.

Wu X., Mueller F. (2013) Elastic and scalable tracing and accurate replay of non-deterministic events, Proceedings of the 27th international ACM conference on International conference on supercomputing. pp. 59-68.

Xiao Y., Huang P., Huang Z., Yu K., Song Y., Guo N., Dai H., Jiang M., Xu Y., Wang D., Wei Q. (2022) Influencing factors on the preservation of lytic bacteriophage VP3. Biosafety and Health 4:314-320. DOI: 10.1016/j.bsheal.2022.06.004.

Yan D., Li Y., Liu Y., Li N., Zhang X., Yan C. (2021) Antimicrobial Properties of Chitosan and Chitosan Derivatives in the Treatment of Enteric Infections. Molecules 26. DOI: 10.3390/molecules26237136.

Zaldastanishvili E., Leshkasheli L., Dadiani M., Nadareishvili L., Askilashvili L., Kvatadze N., Goderdzishvili M., Kutateladze M., Balarjishvili N. (2021) Phage Therapy Experience at the Eliava Phage Therapy Center: Three Cases of Bacterial Persistence. Viruses 13. DOI: 10.3390/v13101901.

Zhang L., Mah T.F. (2008) Involvement of a novel efflux system in biofilm-specific resistance to antibiotics. J Bacteriol 190:4447-52. DOI: 10.1128/jb.01655-07.

Zhang W., Sun J., Ding W., Lin J., Tian R., Lu L., Liu X., Shen X., Qian P.-Y. (2015) Extracellular matrix-associated proteins form an integral and dynamic system during Pseudomonas aeruginosa biofilm development 5. DOI: 10.3389/fcimb.2015.00040.

Zhvania P., Hoyle N.S., Nadareishvili L., Nizharadze D., Kutateladze M. (2017) Phage therapy in a 16-year-old boy with Netherton syndrome. Frontiers in medicine 4:94.

8 ACHIEVMENTS

List of Ph. D. Publications

1. **Deepa Dehari,** Aiswarya Chaudhuri, Dulla Naveen Kumar, Rohit Patil, Mayank Gangwar, Sonam Rastogi, Dinesh Kumar, Gopal Nath, and Ashish Kumar Agrawal. "A Bacteriophage Microgel Effectively Treats the Multidrug-Resistant Acinetobacter baumannii Bacterial Infections in Burn Wounds." Pharmaceuticals 16, no. 7 (2023): 942.
2. **Deepa Dehari,** Aiswarya Chaudhuri, Dulla Naveen Kumar, Meraj Anjum, Rajesh Kumar, Akshay Kumar, Dinesh Kumar, Gopal Nath, and Ashish Kumar Agrawal. "A Bacteriophage-Loaded Microparticle Laden Topical Gel for the Treatment of Multidrug-Resistant Biofilm-Mediated Burn Wound Infection." AAPS PharmSciTech 24, no. 6 (2023): 1-17.
3. **Deepa Dehari,** Aiswarya Chaudhuri, Dulla Naveen Kumar, Meraj Anjum, Rajesh Kumar, Akshay Kumar, Dinesh Kumar, Gopal Nath, and Ashish Kumar Agrawal. “Bacteriophage entrapped chitosan microparticles gel for biofilm-mediated polybacterial infection in burn wounds” (2023): 127-247.

Book Chapters/Publications other than Ph.D. Thesis

1. **Deepa Dehari,** Aiswarya Chaudhuri, Dulla Naveen Kumar, Gopal Nath, and Ashish Kumar Agrawal. "Fiber and textile in drug delivery to combat multidrug resistance microbial infection." In Fiber and Textile Engineering in Drug Delivery Systems, Woodhead Publishing no. 359-387:(2023).
2. **Deepa Dehari,** Aiswarya Chaudhuri, Sanjay Singh, and Ashish Kumar Agrawal. "RNA-Based Vaccines for Infectious Disease." In Gene Delivery Systems, CRC Press, no. 105-128: (2022) (Book chapter)

Training/Conferences

1. Oral presentation on International Conference on Nanotechnology for Better Living (ICNBL 2023) organized by NIT Srinagar, India on May 24-29, (2023)
2. DST STUTI Hands on training program organized by Sophisticated Analytical & Technical Help Institute, Banaras Hindu University, Varanasi, U.P on December 7-13, 2022
3. Participated in One Day Workshop on Green & sustainable technologies initiatives at Indian Institute of Technology (BHU) on November 26, 2022
4. NIPER-DRIL Industry Oriented Training, held at the National Institute of Pharmaceutical Education & Research, Hyderabad, India on December 16-20, 2019

Publications from allied areas

1. Patil, Rohit, **Deepa Dehari**, Aiswarya Chaudhuri, Dulla Naveen Kumar, Dinesh Kumar, Sanjay Singh, Gopal Nath, and Ashish Kumar Agrawal. "Recent advancements in nanotechnology-based Bacteriophage delivery strategies against bacterial ocular infections." Microbiological Research (2023).

2. Mehata, Abhishesh Kumar, **Deepa Dehari,** Vishnu Priya, and Madaswamy S. Muthu. "Drug-releasing textile materials: current developments and future perspectives." In Fiber and Textile Engineering in Drug Delivery Systems, Woodhead Publishing no. 1-38 (2023).

3. Chaudhuri, Aiswarya, Dulla Naveen Kumar, **Deepa Dehari,** Rohit Patil, Sanjay Singh, Dinesh Kumar, and Ashish Kumar Agrawal. "Endorsement of TNBC Biomarkers in Precision Therapy by Nanotechnology." Cancers 15, no. 9 (2023).

4. **Dehari, Deepa,** Abhishesh Kumar Mehata, Vishnu Priya, Dharmnath Parbat, Deepak Kumar, Anand Kumar Srivastava, Sanjay Singh, and Ashish Kumar Agrawal. "Luliconazole nail lacquer for the treatment of onychomycosis: formulation, characterization and in vitro and ex vivo evaluation." AAPS PharmSciTech 23, no. 6 (2022).

5. Joglekar, Aditya Vivek, **Deepa Dehari**, Md Meraj Anjum, Naveen Dulla, Aiswarya Chaudhuri, Sanjay Singh, and Ashish Kumar Agrawal. "Therapeutic potential of venom peptides: Insights in the nanoparticle-mediated venom formulations." Future Journal of Pharmaceutical Sciences 8, no. 1 (2022).

6. Negi, Shloka, Aiswarya Chaudhuri, Dulla Naveen Kumar, **Deepa Dehari**, Sanjay Singh, and Ashish Kumar Agrawal. "Nanotherapeutics in autophagy: A paradigm shift in cancer treatment." Drug Delivery and Translational Research 12, no. 11 (2022).

7. Chaudhuri, Aiswarya, Korra Ramesh, Dulla Naveen Kumar, **Deepa Dehari,** Sanjay Singh, Dinesh Kumar, and Ashish Kumar Agrawal. "Polymeric micelles: A novel drug delivery system for the treatment of breast cancer." Journal of Drug Delivery Science and Technology (2022).

8. Kumar, Dulla Naveen, Aiswarya Chaudhuri, **Deepa Dehari**, Anusmita Shekher, Subash C. Gupta, Shreyasi Majumdar, Sairam Krishnamurthy, Sanjay Singh, Dinesh Kumar, and Ashish Kumar Agrawal. "Combination therapy comprising paclitaxel and 5-fluorouracil by using folic acid functionalized bovine milk exosomes improves the therapeutic efficacy against breast cancer." Life 12, no. 8 (2022).

9. Chaudhuri, Aiswarya, Dulla Naveen Kumar, **Deepa Dehari**, Sanjay Singh, Pradeep

Kumar, Pradeep Kumar Bolla, Dinesh Kumar, and Ashish Kumar Agrawal. "Emergence of nanotechnology as a powerful cavalry against triple-negative breast cancer (TNBC)." Pharmaceuticals 15, no. 5 (2022).

10. Mehata, Abhishesh K., **Deepa Dehari,** Anuj Kumar Mehta, and Alim Miya. "Boosting Innate Immunity During SARS-CoV-2 Clearance." Coronaviruses 2, no. 8 (2021).

11. Mehata, Abhishesh K., **Deepa Dehari,** Amit Gupta, Dangali C. Rabin, and Alim Miya. "Multifunctional liquid crystal nanoparticles for cancer therapy." Current Nanomaterials 6, no. 1 (2021).

12. Anjum, Md Meraj, Krishna Kumar Patel, **Deepa Dehari**, Nidhi Pandey, Ragini Tilak, Ashish Kumar Agrawal, and Sanjay Singh. "Anacardic acid encapsulated solid lipid nanoparticles for Staphylococcus aureus biofilm therapy: Chitosan and DNase coating improves antimicrobial activity." Drug Delivery and Translational Research 11, (2021).

13. Mehata, Abhishesh K., **Deepa Dehari**, Senthil R. Ayyannan, and Madaswamy S. Muthu. "X-ray powder diffraction spectroscopy as a robust tool in early predicting bioavailability of pharmaceutical formulation containing polymorphic drug substance." Drug Delivery Letters 10, no. 3 (2020).

14. Mehata, Abhishesh Kumar, and **Deepa Dehari.** "Bradford assay as a high-throughput bioanalytical screening method for conforming pathophysiological state of the animal." Journal of Drug Delivery and Therapeutics 10, no. 1-s (2020).

15. Bhattacharya, Sankha, Krishna Kumar Patel, **Deepa Dehari,** Ashish Kumar Agrawal, and Sanjay Singh. "Melatonin and its ubiquitous anticancer effects." Molecular and cellular biochemistry 462 (2019).

9 ANNEXURES

All bacterial sample were revived by bacterial stock provided by Prof. Gopal Nath, Dept. of Microbiology, Institute of medical Sciences, Banaras Hindu University, Varanasi, India.

Table 9.1 Host range determination of BPABΦ1 bacteriophage

S. No.	Bacterial strain	BPABΦ1
1	BHU/AB/17	-
2	BHU/AB/18	-
3	BHU/AB/19	-
4	BHU/AB/23	-
5	BHU/AB/24	-
6	BHU/AB/25	-
7	BHU/AB/26	-
8	BHU/AB/28	-
9	BHU/AB/30	-
10	BHU/AB/32	-
11	BHU/AB/36	-
12	BHU/AB/39	+
13	BHU/AB/40	-
14	BHU/AB/41	+
15	BHU/AB/42	+
16	BHU/AB/43	-
17	BHU/AB/50	-
18	BHU/AB/51	-
19	BHU/AB/52	+
20	BHU/AB/53	+
21	BHU/AB/54	-
22	BHU/AB/55	-
23	BHU/AB/56	-
24	BHU/AB/57	+
25	BHU/AB/58	-
26	BHU/AB/59	-
27	BHU/AB/62	+
28	BHU/AB/65	-
29	BHU/AB/66	+
30	BHU/AB/67	-
31	BHU/AB/68	-
32	BHU/AB/69	-

33	BHU/AB/70	-
34	BHU/AB/71	-
35	BHU/AB/72	-
36	BHU/AB/73	+
37	BHU/AB/74	-
38	BHU/AB/75	-
39	BHU/AB/76	+
40	BHU/AB/77	+
41	BHU/AB/78	+
42	BHU/AB/79	-
43	BHU/AB/80	-

Table 9.2 Host range determination of BPKPΦ1 bacteriophage

S. No.	**Bacterial strain**	**BPKPΦ1**
1	BHU/KP/657	+
2	BHU/KP/658	-
3	BHU/KP/659	-
4	BHU/KP/663	-
5	BHU/KP/664	-
6	BHU/KP/665	+
7	BHU/KP/666	-
8	BHU/KP/668	-
9	BHU/KP/669	+
10	BHU/KP/672	-
11	BHU/KP/673	-
12	BHU/KP/674	-
13	BHU/KP/675	+
14	BHU/KP/676	+
15	BHU/KP/677	-
16	BHU/KP/678	-
17	BHU/KP/679	-
18	BHU/KP/680	+
19	BHU/KP/681	-
20	BHU/KP/682	-
21	BHU/KP/683	+
22	BHU/KP/684	-
23	BHU/KP/685	-
24	BHU/KP/686	-
25	BHU/KP/687	-
26	BHU/KP/688	-

27	BHU/KP/689	-
28	BHU/KP/690	+
29	BHU/KP/691	-
30	BHU/KP/692	-
31	BHU/KP/693	-
32	BHU/KP/694	-
33	BHU/KP/695	-
34	BHU/KP/696	+
35	BHU/KP/699	+
36	BHU/KP/700	-
37	BHU/KP/703	-
38	BHU/KP/704	-
39	BHU/KP/705	-
40	BHU/KP/706	+
41	BHU/KP/707	-
42	BHU/KP/708	-
43	BHU/KP/709	-
44	BHU/KP/710	-
45	BHU/KP/711	-
46	BHU/KP/712	+
47	BHU/KP/713	+
48	BHU/KP/714	+
49	BHU/KP/715	-
50	BHU/KP/716	-
51	BHU/KP/717	-
52	BHU/KP/719	-
53	BHU/KP/720	-
54	BHU/KP/721	-
55	BHU/KP/722	-
56	BHU/KP/723	-
57	BHU/KP/724	-
58	BHU/KP/725	-
59	BHU/KP/726	-
60	BHU/KP/727	-
61	BHU/KP/728	-
62	BHU/KP/729	-
63	BHU/KP/730	+
64	BHU/KP/731	-
65	BHU/KP/732	-

Table 9.3 Host range determination of BPSAΦ1 bacteriophage

S. No.	Bacterial strain	BPSAΦ1
1	BHU/SA/4193	+
2	BHU/PA/1956	-
3	BHU/SA/4109	-
4	BHU/SA/4110	-
5	BHU/SA/4111	-
6	BHU/SA/4112	-
7	BHU/SA/4113	-
8	BHU/SA/4114	-
9	BHU/SA/4115	-
10	BHU/SA/4124	-
11	BHU/SA/4125	-
12	BHU/SA/4126	-
13	BHU/SA/4127	-
14	BHU/SA/4128	-
15	BHU/SA/4129	-
16	BHU/SA/4130	-
17	BHU/SA/4141	-
18	BHU/SA/4142	-
19	BHU/SA/4143	-
20	BHU/SA/1087	-
21	BHU/SA/1208	-
22	BHU/SA/1259	-
23	BHU/SA/1302	
24	BHU/PA/1834	+
25	BHU/PA/1835	-
26	BHU/PA/1836	-
27	BHU/PA/1841	+
28	BHU/PA/1848	-
29	BHU/PA/1849	-
30	BHU/PA/1850	-
31	BHU/PA/1851	-
32	BHU/PA/1879	
33	BHU/PA/1880	
34	BHU/PA/1890	+
35	BHU/PA/1891	-
36	BHU/PA/1892	-
37	BHU/PA/1893	-
38	BHU/PA/1894	-
39	BHU/PA/1895	+
40	BHU/PA/1896	+
41	BHU/PA/1935	-

42	BHU/PA/1936	-
43	BHU/PA/1937	-
44	BHU/PA/1948	+
45	BHU/PA/1949	-
46	BHU/PA/1950	-

Table 9.4 Host range determination of BPPAΦ1 bacteriophage

S. No.	Bacterial strain	BPPAΦ1
1	BHU/SA/4193	-
2	BHU/PA/1956	+
3	BHU/SA/4109	-
4	BHU/SA/4110	-
5	BHU/SA/4111	-
6	BHU/SA/4112	-
7	BHU/SA/4113	-
8	BHU/SA/4114	-
9	BHU/SA/4115	-
10	BHU/SA/4124	-
11	BHU/SA/4125	-
12	BHU/SA/4126	-
13	BHU/SA/4127	-
14	BHU/SA/4128	-
15	BHU/SA/4129	-
16	BHU/SA/4130	-
17	BHU/SA/4141	-
18	BHU/SA/4142	-
19	BHU/SA/4143	-
20	BHU/SA/1087	-
21	BHU/SA/1208	-
22	BHU/SA/1259	-
23	BHU/SA/1302	
24	BHU/PA/1834	+
25	BHU/PA/1835	-
26	BHU/PA/1836	-
27	BHU/PA/1841	+
28	BHU/PA/1848	-
29	BHU/PA/1849	-
30	BHU/PA/1850	-
31	BHU/PA/1851	-
32	BHU/PA/1879	-
33	BHU/PA/1880	-
34	BHU/PA/1890	+

35	BHU/PA/1891	-
36	BHU/PA/1892	-
37	BHU/PA/1893	-
38	BHU/PA/1894	-
39	BHU/PA/1895	+
40	BHU/PA/1896	+
41	BHU/PA/1935	-
42	BHU/PA/1936	-
43	BHU/PA/1937	-
44	BHU/PA/1948	+
45	BHU/PA/1949	-
46	BHU/PA/1950	-