

References

- Accurate Assessment of Microbial Viability by Flow Cytometry 2011, July. *BioProbes* 65. Available online: <https://www.thermofisher.com/in/en/home/references/newsletters-and-journals/bioprobables-journal-of-cell-biology-applications/bioprobables-issues-2011/bioprobables-65-july-2011/live-dead-baflight-meets-the-attune-acoustic-focusing-cytometer.html> (accessed on 1 September 2019).
- Adler, A., Khabra, E., Chmelnitsky, I., Giakkoupi, P., Vatopoulos, A., Mathers, A. J., Yeh, A. J., Sifri, C. D., De Angelis, G., Tacconelli, E., Villegas, M. V., Quinn, J., & Carmeli, Y. (2014). Development and validation of a multiplex PCR assay for identification of the epidemic ST-258/512 KPC-producing *Klebsiella pneumoniae* clone. *Diagnostic microbiology and infectious disease*, 78(1), 12–15.
- Aeschlimann, J. R. (2003). The role of multidrug efflux pumps in the antibiotic resistance of *Pseudomonas aeruginosa* and other gram-negative bacteria: insights from the Society of Infectious Diseases Pharmacists. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*, 23(7), 916–924.
- Alcock, B. P., Raphenya, A. R., Lau, T., Tsang, K. K., Bouchard, M., Edalatmand, A., Huynh, W., Nguyen, A. V., Cheng, A. A., Liu, S., Min, S. Y., Miroshnichenko, A., Tran, H. K., Werfalli, R. E., Nasir, J. A., Oloni, M., Speicher, D. J., Florescu, A., Singh, B., Faltyn, M., ... McArthur, A. G. (2020). CARD 2020: antibiotic resistance surveillance with the comprehensive antibiotic resistance database. *Nucleic acids research*, 48(D1), D517–D525. <https://doi.org/10.1093/nar/gkz935>. Retrieved from <https://card.mcmaster.ca/ontology/36305> (accessed on 1 May 2021).
- Alghoribi, M. F., Alqurashi, M., Okdah, L., Alalwan, B., AlHebaishi, Y. S., Almalki, A., ... & Barry, M. (2021). Successful treatment of infective endocarditis due to pandrug-resistant *Klebsiella pneumoniae* with ceftazidime-avibactam and aztreonam. *Scientific reports*, 11(1), 1–9.
- Alp, E., Percin, D. U. Y. G. U., Colakoğlu, S., Durmaz, S., Kürkcü, C. A., Ekincioglu, P., & Güneş, T. A. M. E. R. (2013). Molecular characterization of carbapenem-resistant *Klebsiella pneumoniae* in a tertiary university hospital in Turkey. *Journal of Hospital Infection*, 84(2), 178–180.
- Anderl, J. N., Zahller, J., Roe, F., & Stewart, P. S. (2003). Role of nutrient limitation and stationary-phase existence in *Klebsiella pneumoniae* biofilm resistance to ampicillin and ciprofloxacin. *Antimicrobial agents and chemotherapy*, 47(4), 1251–1256.
- Andrade, L. N., Curiao, T., Ferreira, J. C., Longo, J. M., Clímaco, E. C., Martinez, R., ... & Coque, T. M. (2011). Dissemination of bla KPC-2 by the spread of *Klebsiella pneumoniae* clonal complex 258 clones (ST258, ST11, ST437) and plasmids (IncFII, IncN, IncL/M) among Enterobacteriaceae species in Brazil. *Antimicrobial agents and chemotherapy*, 55(7), 3579–3583.
- Angelin, J., & Kavitha, M. (2020). Exopolysaccharides from probiotic bacteria and their health potential. *International journal of biological macromolecules*, 162, 853–865. <https://doi.org/10.1016/j.ijbiomac.2020.06.190>.
- Ares, M. A., Sansabas, A., Rodríguez-Valverde, D., Siqueiros-Cendón, T., Rascón-Cruz, Q., Rosales-Reyes, R., ... & De la Cruz, M. A. (2019). The interaction of *Klebsiella pneumoniae* with lipid rafts-associated cholesterol increases macrophage-mediated phagocytosis due to down regulation of the capsule polysaccharide. *Frontiers in cellular and infection microbiology*, 9, 255.
- Arthur, M., Molinas, C., Mabilat, C., & Courvalin, P. (1990). Detection of erythromycin resistance by the polymerase chain reaction using primers in conserved regions of erm rRNA methylase genes. *Antimicrobial Agents and Chemotherapy*, 34(10), 2024–2026.
- Aubert, D., Naas, T., Héritier, C., Poirel, L., & Nordmann, P. (2006). Functional characterization of IS 1999, an IS 4 family element involved in mobilization and expression of β -lactam resistance genes. *Journal of bacteriology*, 188(18), 6506–6514.
- Avgoulea, K., Di Pilato, V., Zarkotou, O., Sennati, S., Politi, L., Cannatelli, A., ... & Pournaras, S. (2018). Characterization of extensively drug-resistant or pandrug-resistant sequence type 147 and 101 OXA-48-producing *Klebsiella pneumoniae* causing bloodstream infections in patients in an intensive care unit. *Antimicrobial agents and chemotherapy*, 62(7).
- Azam, M., Gained, R., Yadav, G., Sharma, A., Upmanyu, K., Jain, M., & Singh, R. (2021). Colistin Resistance Among Multiple Sequence Types of *Klebsiella pneumoniae* Is Associated With Diverse Resistance Mechanisms: A Report From India. *Frontiers in microbiology*, 12, 215.
- Bagley, S. T. (1985). Habitat association of *Klebsiella* species. *Infection Control & Hospital Epidemiology*, 6(2), 52–58.

References

- Balestrino, D., Ghigo, J. M., Charbonnel, N., Haagensen, J. A., & Forestier, C. (2008). The characterization of functions involved in the establishment and maturation of *Klebsiella pneumoniae* in vitro biofilm reveals dual roles for surface exopolysaccharides. *Environmental microbiology*, *10*(3), 685–701.
- Bandeira, M., Carvalho, P. A., Duarte, A., & Jordao, L. (2014). Exploring dangerous connections between *Klebsiella pneumoniae* biofilms and healthcare-associated infections. *Pathogens*, *3*(3), 720-731.
- Banerjee, K., Motley, M. P., Diago-Navarro, E., & Fries, B. C. (2021). Serum Antibody Responses against Carbapenem-Resistant *Klebsiella pneumoniae* in Infected Patients. *MSphere*, *6*(2), e01335-20.
- Barguigua, A., El Otmani, F., Zerouali, K., Talmi, M., & Timinouni, M. (2012). Prevalence of carbapenemase producing Enterobacteriaceae in Moroccan community. In *Twenty-second European Congress of Clinical Microbiology and Infectious Diseases, London, UK*.
- Bascomb, S., Lapage, S. P., Willcox, W. R., & Curtis, M. A. (1971). Numerical classification of the tribe Klebsielleae. *Microbiology*, *66*(3), 279-295.
- Bayles, K. W. (2014). Bacterial programmed cell death: making sense of a paradox. *Nature Reviews Microbiology*, *12*(1), 63-69.
- Bellich, B., Lagatolla, C., Tossi, A., Benincasa, M., Cescutti, P., & Rizzo, R. (2018). Influence of Bacterial Biofilm Polysaccharide Structure on Interactions with Antimicrobial Peptides: A Study on *Klebsiella pneumoniae*. *International journal of molecular sciences*, *19*(6), 1685.
- Benincasa, M., Lagatolla, C., Dolzani, L., Milan, A., Pacor, S., Liut, G., Tossi, A., Cescutti, P., & Rizzo, R. (2016). Biofilms from *Klebsiella pneumoniae*: Matrix Polysaccharide Structure and Interactions with Antimicrobial Peptides. *Microorganisms*, *4*(3), 26.
- Bergey, D. H., & GH, J. (1994). Bergey's manual of determinative biology. 9th ed. *Chapter, 4*, 181-186.
- Berrazeg, M., Diene, S. M., Medjahed, L., Parola, P., Drissi, M., Raoult, D., & Rolain, J. M. (2014). New Delhi Metallo-beta-lactamase around the world: an eReview using Google Maps. *Eurosurveillance*, *19*(20), 20809.
- Berry, G. J., Loeffelholz, M. J., & Williams-Bouyer, N. (2015). An investigation into laboratory misidentification of a bloodstream *Klebsiella variicola* infection. *Journal of clinical microbiology*, *53*(8), 2793-2794.
- Beyrouthy, R., Robin, F., Dabboussi, F., Mallat, H., Hamze, M., & Bonnet, R. (2014). Carbapenemase and virulence factors of Enterobacteriaceae in North Lebanon between 2008 and 2012: evolution via endemic spread of OXA-48. *Journal of Antimicrobial Chemotherapy*, *69*(10), 2699-2705.
- Bhardwaj, V., Annapandian, V. M., Sinazer, A. R., Alva, A., & Prasad, S. (2020). Incidence, risk factors and clinical outcomes of patients with hypermucoviscoid *Klebsiella* in a tertiary intensive care unit. *Journal of Global Infectious Diseases*, *12*(4), 202.
- Bialek-Davenet, S., Criscuolo, A., Ailloud, F., Passet, V., Jones, L., Delannoy-Vieillard, A. S., ... & Brisse, S. (2014). Genomic definition of hypervirulent and multidrug-resistant *Klebsiella pneumoniae* clonal groups. *Emerging infectious diseases*, *20*(11), 1812.
- Bokaecian, M., Saecidi, S., Shahi, Z., & Kadaei, V. (2014). TetA and tetB Genes in *Klebsiella pneumoniae* isolated from clinical samples. *Gene, Cell and Tissue*, *1*(2).
- Bonura, C., Giuffrè, M., Aleo, A., Fasciana, T., Di Bernardo, F., Stampone, T., Giammanco, A., MDR-GN Working Group, Palma, D. M., & Mammina, C. (2015). An Update of the Evolving Epidemic of blaKPC Carrying *Klebsiella pneumoniae* in Sicily, Italy, 2014: Emergence of Multiple Non-ST258 Clones. *PLoS one*, *10*(7), e0132936.
- Boucher, H. W., Talbot, G. H., Bradley, J. S., Edwards, J. E., Gilbert, D., Rice, L. B., ... & Bartlett, J. (2009). Bad bugs, no drugs: no ESCAPE! An update from the Infectious Diseases Society of America. *Clinical infectious diseases*, *48*(1), 1-12.
- Bowers, J. R., Kitchel, B., Driebe, E. M., MacCannell, D. R., Roe, C., Lemmer, D., ... & Limbago, B. M. (2015). Genomic analysis of the emergence and rapid global dissemination of the clonal group 258 *Klebsiella pneumoniae* pandemic. *PLoS One*, *10*(7), e0133727.
- Brenner, D. J., Steigerwalt, A. G., & Fanning, G. R. (1972). Differentiation of Enterobacter aerogenes from *Klebsiellae* by deoxyribonucleic acid reassociation. *International Journal of Systematic and Evolutionary Microbiology*, *22*(4), 193-200.
- Brimacombe, C. A., & Beatty, J. T. (2013). Surface polysaccharide extraction and quantification. *Bio-protocol*, *3*(20), e934-e934.

- Brisse, S., & Verhoef, J. (2001). Phylogenetic diversity of *Klebsiella pneumoniae* and *Klebsiella oxytoca* clinical isolates revealed by randomly amplified polymorphic DNA, *gyrA* and *parC* genes sequencing and automated ribotyping. *International journal of systematic and evolutionary microbiology*, *51*(3), 915-924.
- Brisse, S., Fevre, C., Passet, V., Issenhuth-Jeanjean, S., Tournebize, R., Diancourt, L., & Grimont, P. (2009). Virulent clones of *Klebsiella pneumoniae*: identification and evolutionary scenario based on genomic and phenotypic characterization. *PloS one*, *4*(3), e4982.
- Brisse, S., Issenhuth-Jeanjean, S., & Grimont, P. A. (2004). Molecular serotyping of *Klebsiella* species isolates by restriction of the amplified capsular antigen gene cluster. *Journal of clinical microbiology*, *42*(8), 3388-3398.
- Brisse, S., Passet, V., & Grimont, P. (2014). Description of *Klebsiella quasipneumoniae* sp. nov., isolated from human infections, with two subspecies, *Klebsiella quasipneumoniae* subsp. *quasipneumoniae* subsp. nov. and *Klebsiella quasipneumoniae* subsp. *similipneumoniae* subsp. nov., and demonstration that *Klebsiella singaporensis* is a junior heterotypic synonym of *Klebsiella variicola*. *International journal of systematic and evolutionary microbiology*, *64*(Pt 9), 3146–3152.
- Brisse, S., Passet, V., Haugaard, A. B., Babosan, A., Kassis-Chikhani, N., Struve, C., & Decré, D. (2013). *wzi* gene sequencing, a rapid method for determination of capsular type for *Klebsiella* strains. *Journal of clinical microbiology*, *51*(12), 4073-4078.
- Brisse, S., Van Himbergen, T., Kusters, K., & Verhoef, J. (2004). Development of a rapid identification method for *Klebsiella pneumoniae* phylogenetic groups and analysis of 420 clinical isolates. *Clinical microbiology and infection*, *10*(10), 942-945.
- Bush, K. (2018). Past and present perspectives on β -lactamases. *Antimicrobial agents and chemotherapy*, *62*(10), e01076-18.
- Calà, C., Amodio, E., Di Carlo, E., Virruso, R., Fasciana, T., & Giammanco, A. (2015). Biofilm production in *Staphylococcus epidermidis* strains, isolated from the skin of hospitalized patients: genetic and phenotypic characteristics. *The new microbiologica*, *38*(4), 521–529.
- Cannatelli, A., Giani, T., D'Andrea, M. M., Di Pilato, V., Arena, F., Conte, V., ... & Rossolini, G. M. (2014). MgrB inactivation is a common mechanism of colistin resistance in KPC-producing *Klebsiella pneumoniae* of clinical origin. *Antimicrobial agents and chemotherapy*, *58*(10), 5696-5703.
- Cano, E. J., Cafilisch, K. M., Bollyky, P. L., Van Belleghem, J. D., Patel, R., Fackler, J., ... & Suh, G. A. (2021). Phage therapy for limb-threatening prosthetic knee *Klebsiella pneumoniae* infection: case report and in vitro characterization of anti-biofilm activity. *Clinical Infectious Diseases*, *73*(1), e144-e151.
- Cantón, R., Akóva, M., Carmeli, Y., Giske, C. G., Glupczynski, Y., Gniadkowski, M., ... & Nordmann, P. (2012). Rapid evolution and spread of carbapenemases among Enterobacteriaceae in Europe. *Clinical microbiology and infection*, *18*(5), 413-431.
- Caputo, A., Fournier, P. E., & Raoult, D. (2019). Genome and pan-genome analysis to classify emerging bacteria. *Biology direct*, *14*(1), 5.
- Carattoli, A., Villa, L., Poirel, L., Bonnin, R. A., & Nordmann, P. (2012). Evolution of IncA/C bla CMY-2-carrying plasmids by acquisition of the bla NDM-1 carbapenemase gene. *Antimicrobial agents and chemotherapy*, *56*(2), 783-786.
- Catalán-Nájera, J. C., Garza-Ramos, U., & Barrios-Camacho, H. (2017). Hypervirulence and hypermucoviscosity: two different but complementary *Klebsiella* spp. phenotypes?. *Virulence*, *8*(7), 1111-1123.
- Cavalcanti, F. C. N., Rodrigues, J. F., Cabral, A. B., Azarias, L. C. B. D., Morais Júnior, M. A. D., Castro, C. M. M. B. D., & Lopes, A. C. D. S. (2019). Relationships between phagocytosis, mucoid phenotype, and genetic characteristics of *Klebsiella pneumoniae* clinical isolates. *Revista da Sociedade Brasileira de Medicina Tropical*, *52*.
- CDC. 2015. CDC works 24/7 to protect US from health, safety and security threats. CDC, Atlanta, GA.
- Centers for Disease Control and Prevention (CDC). (2010). Detection of Enterobacteriaceae isolates carrying metallo-beta-lactamase-United States, 2010. *MMWR. Morbidity and mortality weekly report*, *59*(24), 750.
- Centers for Disease Control and Prevention (CDC). (2019). Retrieved from: <https://www.cdc.gov/drugresistance/biggest-threats.html> (accessed on July 2019).

References

- Centers for Disease Control and Prevention. 2013. Antibiotic resistance threats in the United States, 2013. Centers for Disease Control and Prevention, Atlanta, GA. Retrieved from <http://www.cdc.gov/drugresistance/pdf/ar-threats-2013-508.pdf>. Last accessed November 25th, 2017.
- Cescutti, P., De Benedetto, G., & Rizzo, R. (2016). Structural determination of the polysaccharide isolated from biofilms produced by a clinical strain of *Klebsiella pneumoniae*. *Carbohydrate research*, *430*, 29–35.
- Chaves, J., Ladona, M. G., Segura, C., Coira, A., Reig, R., & Ampurdanés, C. (2001). SHV-1 β -lactamase is mainly a chromosomally encoded species-specific enzyme in *Klebsiella pneumoniae*. *Antimicrobial agents and chemotherapy*, *45*(10), 2856-2861.
- Chen, C. J., Wu, T. L., Lu, P. L., Chen, Y. T., Fung, C. P., Chuang, Y. C., ... & Siu, L. K. (2014). Closely related NDM-1-encoding plasmids from *Escherichia coli* and *Klebsiella pneumoniae* in Taiwan. *PLoS one*, *9*(8), e104899.
- Chen, D., Li, H., Zhao, Y., Qiu, Y., Xiao, L., He, H., ... & Chen, F. (2020). Characterization of carbapenem-resistant *Klebsiella pneumoniae* in a tertiary hospital in Fuzhou, China. *Journal of applied microbiology*, *129*(5), 1220-1226.
- Chen, L., Chavda, K. D., Findlay, J., Peirano, G., Hopkins, K., Pitout, J. D., ... & Kreiswirth, B. N. (2014). Multiplex PCR for identification of two capsular types in epidemic KPC-producing *Klebsiella pneumoniae* sequence type 258 strains. *Antimicrobial agents and chemotherapy*, *58*(7), 4196-4199.
- Chen, L., Chavda, K. D., Melano, R. G., Jacobs, M. R., Levi, M. H., Bonomo, R. A., & Kreiswirth, B. N. (2013). Complete sequence of a bla KPC-2-harboring IncFIIK1 plasmid from a *Klebsiella pneumoniae* sequence type 258 strain. *Antimicrobial agents and chemotherapy*, *57*(3), 1542-1545.
- Chen, L., Mathema, B., Chavda, K. D., DeLeo, F. R., Bonomo, R. A., & Kreiswirth, B. N. (2014). Carbapenemase-producing *Klebsiella pneumoniae*: molecular and genetic decoding. *Trends in microbiology*, *22*(12), 686-696.
- Chen, L., Mathema, B., Pitout, J. D., DeLeo, F. R., & Kreiswirth, B. N. (2014). Epidemic *Klebsiella pneumoniae* ST258 is a hybrid strain. *MBio*, *5*(3), e01355-14.
- Chen, Q., Zhou, J., Wu, S., Yang, Y., Yu, D., Wang, X., & Wu, M. (2020). Characterization of the IncX3 Plasmid Producing blaNDM-7 From *Klebsiella pneumoniae* ST34. *Frontiers in Microbiology*, *11*, 1885.
- Chen, T., Dong, G., Zhang, S., Zhang, X., Zhao, Y., Cao, J., ... & Wu, Q. (2020). Effects of iron on the growth, biofilm formation and virulence of *Klebsiella pneumoniae* causing liver abscess. *BMC microbiology*, *20*(1), 1-7.
- Cheng, H. Y., Chen, Y. S., Wu, C. Y., Chang, H. Y., Lai, Y. C., & Peng, H. L. (2010). RmpA regulation of capsular polysaccharide biosynthesis in *Klebsiella pneumoniae* CG43. *Journal of bacteriology*, *192*(12), 3144-3158.
- Chmelnitsky, I., Shklyar, M., Hermesh, O., Navon-Venezia, S., Edgar, R., & Carmeli, Y. (2013). Unique genes identified in the epidemic extremely drug-resistant KPC-producing *Klebsiella pneumoniae* sequence type 258. *Journal of antimicrobial chemotherapy*, *68*(1), 74-83.
- Choby, J. E., Howard-Anderson, J., & Weiss, D. S. (2020). Hypervirulent *Klebsiella pneumoniae*—clinical and molecular perspectives. *Journal of internal medicine*, *287*(3), 283-300.
- Choi, M. J., & Ko, K. S. (2015). Loss of hypermucoviscosity and increased fitness cost in colistin-resistant *Klebsiella pneumoniae* sequence type 23 strains. *Antimicrobial agents and chemotherapy*, *59*(11), 6763-6773.
- Choi, M., Hegerle, N., Nkeze, J., Sen, S., Jamindar, S., Nasrin, S., ... & Tennant, S. M. (2020). The diversity of lipopolysaccharide (o) and capsular polysaccharide (K) antigens of invasive *Klebsiella pneumoniae* in a Multi-Country collection. *Frontiers in microbiology*, *11*, 1249.
- Chuang, Y. P., Fang, C. T., Lai, S. Y., Chang, S. C., & Wang, J. T. (2006). Genetic determinants of capsular serotype K1 of *Klebsiella pneumoniae* causing primary pyogenic liver abscess. *The Journal of infectious diseases*, *193*(5), 645-654.
- Clegg, S., & Murphy, C. N. (2016). Epidemiology and virulence of *Klebsiella pneumoniae*. *Microbiology spectrum*, *4*(1), 4-1.
- Claverys, J. P., & Håvarstein, L. S. (2007). Cannibalism and fratricide: mechanisms and raisons d'être. *Nature Reviews Microbiology*, *5*(3), 219-229.
- Clinical and Laboratory Standards Institute. (2016). Methods for dilution antimicrobial susceptibility tests for

- bacteria that grow aerobically; approved standard—26th ed. *CLSI document M100S*. Clinical and Laboratory Standards Institute, Wayne, PA.
- Coelho, A., González-López, J. J., Miró, E., Alonso-Tarrés, C., Mirelis, B., Larrosa, M. N., ... & Prats, G. (2010). Characterisation of the CTX-M-15-encoding gene in *Klebsiella pneumoniae* strains from the Barcelona metropolitan area: plasmid diversity and chromosomal integration. *International journal of antimicrobial agents*, *36*(1), 73-78.
- Compain, F., Babosan, A., Brisse, S., Genel, N., Audo, J., Ailloud, F., ... & Decré, D. (2014). Multiplex PCR for detection of seven virulence factors and K1/K2 capsular serotypes of *Klebsiella pneumoniae*. *Journal of clinical microbiology*, *52*(12), 4377-4380.
- Cortés, G., Borrell, N., de Astorza, B., Gómez, C., Sauleda, J., & Albertí, S. (2002). Molecular analysis of the contribution of the capsular polysaccharide and the lipopolysaccharide O side chain to the virulence of *Klebsiella pneumoniae* in a murine model of pneumonia. *Infection and immunity*, *70*(5), 2583-2590.
- Crémet, L., Corvec, S., Batard, E., Auger, M., Lopez, I., Pagniez, F., ... & Caroff, N. (2013). Comparison of three methods to study biofilm formation by clinical strains of *Escherichia coli*. *Diagnostic microbiology and infectious disease*, *75*(3), 252-255.
- Cress, B. F., Englaender, J. A., He, W., Kasper, D., Linhardt, R. J., & Koffas, M. A. (2014). Masquerading microbial pathogens: capsular polysaccharides mimic host-tissue molecules. *FEMS microbiology reviews*, *38*(4), 660-697.
- Croucher, N. J., Page, A. J., Connor, T. R., Delaney, A. J., Keane, J. A., Bentley, S. D., ... & Harris, S. R. (2015). Rapid phylogenetic analysis of large samples of recombinant bacterial whole genome sequences using Gubbins. *Nucleic acids research*, *43*(3), e15-e15.
- Cubero, M., Grau, I., Tubau, F., Pallarés, R., Dominguez, M. A., Linares, J., & Ardanuy, C. (2016). Hypervirulent *Klebsiella pneumoniae* clones causing bacteraemia in adults in a teaching hospital in Barcelona, Spain (2007–2013). *Clinical Microbiology and Infection*, *22*(2), 154-160.
- Cuzon, G., Ouanich, J., Gondret, R., Naas, T., & Nordmann, P. (2011). Outbreak of OXA-48-positive carbapenem-resistant *Klebsiella pneumoniae* isolates in France. *Antimicrobial agents and chemotherapy*, *55*(5), 2420-2423.
- Czobor, I., Novais, Â., Rodrigues, C., Chifiriuc, M. C., Mihăescu, G., Lazăr, V., & Peixe, L. (2016). Efficient transmission of IncFIIY and IncL plasmids and *Klebsiella pneumoniae* ST101 clone producing OXA-48, NDM-1 or OXA-181 in Bucharest hospitals. *International journal of antimicrobial agents*, *48*(2), 223-224.
- Damjanova, I., Toth, A., Paszti, J., Hajbel-Vékony, G., Jakab, M., Berta, J., ... & Füzi, M. (2008). Expansion and countrywide dissemination of ST11, ST15 and ST147 ciprofloxacin-resistant CTX-M-15-type β -lactamase-producing *Klebsiella pneumoniae* epidemic clones in Hungary in 2005—the new ‘MRSAs’?. *Journal of Antimicrobial Chemotherapy*, *62*(5), 978-985.
- Davies, D. (2003). Understanding biofilm resistance to antibacterial agents. *Nature reviews Drug discovery*, *2*(2), 114-122.
- Davin-Regli, A. (2015). *Enterobacter aerogenes* and *Enterobacter cloacae*; versatile bacterial pathogens confronting antibiotic treatment. *Frontiers in microbiology*, *6*, 392.
- de Campos, P. A., Royer, S., Batistão, D. W., Araújo, B. F., Queiroz, L. L., de Brito, C. S., Gontijo-Filho, P. P., & Ribas, R. M. (2016). Multidrug Resistance Related to Biofilm Formation in *Acinetobacter baumannii* and *Klebsiella pneumoniae* Clinical Strains from Different Pulsotypes. *Current microbiology*, *72*(5), 617–627.
- de Groot, R. O. N. A. L. D., Sluijter, M., de Bruyn, A., Campos, J., Goessens, W. H., Smith, A. L., & Hermans, P. W. (1996). Genetic characterization of trimethoprim resistance in *Haemophilus influenzae*. *Antimicrobial agents and chemotherapy*, *40*(9), 2131-2136.
- De Lillo, A., Ashley, F. P., Palmer, R. M., Munson, M. A., Kyriacou, L., Weightman, A. J., & Wade, W. G. (2006). Novel subgingival bacterial phylotypes detected using multiple universal polymerase chain reaction primer sets. *Oral microbiology and immunology*, *21*(1), 61-68.
- de Man, T. J., Lutgring, J. D., Lonsway, D. R., Anderson, K. F., Kiehlbauch, J. A., Chen, L., ... & Halpin, A. L. (2018). Genomic analysis of a pan-resistant isolate of *Klebsiella pneumoniae*, United States 2016. *MBio*, *9*(2), e00440-18.
- Desai, S., Sanghrajka, K., & Gajjar, D. (2019). High adhesion and increased cell death contribute to strong biofilm formation in *Klebsiella pneumoniae*. *Pathogens*, *8*(4), 277.

References

- Dey, S., Gaur, M., Sahoo, R. K., Das, A., Jain, B., Pati, S., & Subudhi, E. (2020). Genomic characterization of XDR *Klebsiella pneumoniae* ST147 co-resistant to carbapenem and colistin—The first report in India. *Journal of Global Antimicrobial Resistance*, 22, 54–56.
- Diago-Navarro, E., Chen, L., Passet, V., Burack, S., Ulacia-Hernando, A., Kodiyanplakkal, R. P., Levi, M. H., Brisse, S., Kreiswirth, B. N., & Fries, B. C. (2014). Carbapenem-resistant *Klebsiella pneumoniae* exhibit variability in capsular polysaccharide and capsule associated virulence traits. *The Journal of infectious diseases*, 210(5), 803–813.
- Diancourt, L., Passet, V., Verhoef, J., Grimont, P. A., & Brisse, S. (2005). Multilocus sequence typing of *Klebsiella pneumoniae* nosocomial isolates. *Journal of clinical microbiology*, 43(8), 4178–4182.
- Doi, Y., Hazen, T. H., Boitano, M., Tsai, Y. C., Clark, T. A., Korlach, J., & Rasko, D. A. (2014). Whole-genome assembly of *Klebsiella pneumoniae* coproducing NDM-1 and OXA-232 carbapenemases using single-molecule, real-time sequencing. *Antimicrobial agents and chemotherapy*, 58(10), 5947–5953.
- Doi, Y., Wachino, J. I., & Arakawa, Y. (2016). Aminoglycoside resistance: the emergence of acquired 16S ribosomal RNA methyltransferases. *Infectious Disease Clinics*, 30(2), 523–537.
- Dolejska, M., Villa, L., Dobiasova, H., Fortini, D., Feudi, C., & Carattoli, A. (2013). Plasmid content of a clinically relevant *Klebsiella pneumoniae* clone from the Czech Republic producing CTX-M-15 and QnrB1. *Antimicrobial agents and chemotherapy*, 57(2), 1073–1076.
- Domenech, M., García, E., Prieto, A., & Moscoso, M. (2013). Insight into the composition of the intercellular matrix of *Streptococcus pneumoniae* biofilms. *Environmental microbiology*, 15(2), 502–516.
- Domenico, P., Salo, R. J., Cross, A. S., & Cunha, B. A. (1994). Polysaccharide capsule-mediated resistance to opsonophagocytosis in *Klebsiella pneumoniae*. *Infection and immunity*, 62(10), 4495–4499.
- Dong, D., Liu, W., Li, H., Wang, Y., Li, X., Zou, D., ... & Yuan, J. (2015). Survey and rapid detection of *Klebsiella pneumoniae* in clinical samples targeting the *rcaA* gene in Beijing, China. *Frontiers in microbiology*, 6, 519.
- Donlan, R. M. (2002). Biofilms: microbial life on surfaces. *Emerging infectious diseases*, 8(9), 881.
- Dortet, L., Broda, A., Bernabeu, S., Glupczynski, Y., Bogaerts, P., Bonnin, R., Naas, T., Filloux, A., & Larrouy-Maumus, G. (2020). Optimization of the MALDIx test for the rapid identification of colistin resistance in *Klebsiella pneumoniae* using MALDI-TOF MS. *The Journal of antimicrobial chemotherapy*, 75(1), 110–116.
- Drieux, L., Brossier, F., Sougakoff, W., & Jarlier, V. (2008). Phenotypic detection of extended-spectrum beta-lactamase production in Enterobacteriaceae: review and bench guide. *Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases*, 14 Suppl 1, 90–103.
- Edwards, P. R., & Ewing, W. H. (1962). Identification of Enterobacteriaceae, Burgess Publ. Co. *Minneapolis, Minnesota*.
- Edwards, P. R., & Fife, M. A. (1952). Capsule types of *Klebsiella*. *The Journal of infectious diseases*, 92–104.
- Effah, C. Y., Sun, T., Liu, S., & Wu, Y. (2020). *Klebsiella pneumoniae*: an increasing threat to public health. *Annals of clinical microbiology and antimicrobials*, 19(1), 1–9.
- El-Domany, R. A., Awadalla, O. A., Shabana, S. A., El-Dardir, M. A., & Emara, M. (2021). Analysis of the Correlation Between Antibiotic Resistance Patterns and Virulence Determinants in Pathogenic *Klebsiella pneumoniae* Isolates from Egypt. *Microbial drug resistance (Larchmont, N.Y.)*, 27(6), 727–739.
- Ellington, M. J., Kistler, J., Livermore, D. M., & Woodford, N. (2007). Multiplex PCR for rapid detection of genes encoding acquired metallo- β -lactamases. *Journal of Antimicrobial Chemotherapy*, 59(2), 321–322.
- Espenhain, L., Jørgensen, S. B., Leegaard, T. M., Lelek, M. M., Hänsen, S. H., Nakstad, B., ... & Steinbakk, M. (2018). Travel to Asia is a strong predictor for carriage of cephalosporin resistant *E. coli* and *Klebsiella* spp. but does not explain everything; prevalence study at a Norwegian hospital 2014–2016. *Antimicrobial Resistance & Infection Control*, 7(1), 1–8.
- Evans, B. A., & Amyes, S. G. (2014). OXA β -lactamases. *Clinical microbiology reviews*, 27(2), 241–263.
- Ewing, W. H. (1966). Enterobacteriaceae taxonomy and nomenclature. National Communicable Disease Center. *Public Health Service, Atlanta*.
- Fagerlind, M. G., Webb, J. S., Barraud, N., McDougald, D., Jansson, A., Nilsson, P., ... & Rice, S. A. (2012). Dynamic modelling of cell death during biofilm development. *Journal of theoretical biology*, 295, 23–36.

- Fajardo-Lubián, A., Ben Zakour, N. L., Agyekum, A., Qi, Q., & Iredell, J. R. (2019). Host adaptation and convergent evolution increases antibiotic resistance without loss of virulence in a major human pathogen. *PLoS pathogens*, *15*(3), e1007218.
- Falagas, M. E., Kasiakou, S. K., & Saravolatz, L. D. (2005). Colistin: the revival of polymyxins for the management of multidrug-resistant gram-negative bacterial infections. *Clinical infectious diseases*, *40*(9), 1333-1341.
- Falcone, M., Giordano, C., Barnini, S., Tiseo, G., Leonildi, A., Malacarne, P., ... & Carattoli, A. (2020). Extremely drug-resistant NDM-9-producing ST147 *Klebsiella pneumoniae* causing infections in Italy, May 2020. *Eurosurveillance*, *25*(48), 2001779.
- Fang, C. T., Chuang, Y. P., Shun, C. T., Chang, S. C., & Wang, J. T. (2004). A novel virulence gene in *Klebsiella pneumoniae* strains causing primary liver abscess and septic metastatic complications. *Journal of Experimental Medicine*, *199*(5), 697-705.
- Fang, C. T., Lai, S. Y., Yi, W. C., Hsueh, P. R., Liu, K. L., & Chang, S. C. (2007). *Klebsiella pneumoniae* genotype K1: an emerging pathogen that causes septic ocular or central nervous system complications from pyogenic liver abscess. *Clinical infectious diseases*, *45*(3), 284-293.
- Fang, R., Liu, H., Zhang, X., Dong, G., Li, J., Tian, X., ... & Zhou, T. (2021). Difference in biofilm formation between carbapenem-resistant and carbapenem-sensitive *Klebsiella pneumoniae* based on analysis of mrkH distribution. *Microbial Pathogenesis*, *152*, 104743.
- Farmer, J., Davis, B. R., Hickman-Brenner, F. W., McWhorter, A., Huntley-Carter, G. P., Asbury, M. A., ... & Fanning, G. R. (1985). Biochemical identification of new species and biogroups of Enterobacteriaceae isolated from clinical specimens. *Journal of clinical microbiology*, *21*(1), 46-76.
- Fedrigo, N. H., Mazucheli, J., Albiero, J., Shinohara, D. R., Lodi, F. G., dos Santos Machado, A. C., ... & Tognim, M. C. B. (2017). Pharmacodynamic evaluation of fosfomycin against *Escherichia coli* and *Klebsiella* spp. from urinary tract infections and the influence of pH on fosfomycin activities. *Antimicrobial agents and chemotherapy*, *61*(8).
- Feneley, R. C., Hopley, I. B., & Wells, P. N. (2015). Urinary catheters: history, current status, adverse events and research agenda. *Journal of medical engineering & technology*, *39*(8), 459-470.
- Fevre, C., Passet, V., Deletoile, A., Barbe, V., Frangeul, L., Almeida, A. S., ... & Brisse, S. (2011). PCR-based identification of *Klebsiella pneumoniae* subsp. *rhinoscleromatis*, the agent of rhinoscleroma. *PLoS neglected tropical diseases*, *5*(5), e1052.
- Fife, M. A., Ewing, W. H., & Davis, B. R. (1965). The Biochemical Reactions of the Tribe Klebsiellae. Communicable Disease Center, US. *Public Health Service, Atlanta, Georgia*.
- Flemming, H. C., & Wingender, J. (2010). The biofilm matrix. *Nat Rev Microbiol*.
- Fonseca, E. L., da Veiga Ramos, N., Andrade, B. G. N., Morais, L. L., Marin, M. F. A., & Vicente, A. C. P. (2017). A one-step multiplex PCR to identify *Klebsiella pneumoniae*, *Klebsiella variicola*, and *Klebsiella quasipneumoniae* in the clinical routine. *Diagnostic microbiology and infectious disease*, *87*(4), 315-317.
- Fridrich, E., & Whitfield, C. (2005). Lipopolysaccharide inner core oligosaccharide structure and outer membrane stability in human pathogens belonging to the Enterobacteriaceae. *Journal of endotoxin research*, *11*(3), 133-144.
- Frost, L. S., Leplae, R., Summers, A. O., & Toussaint, A. (2005). Mobile genetic elements: the agents of open source evolution. *Nature Reviews Microbiology*, *3*(9), 722-732.
- Fung, C. P., Chang, F. Y., Lee, S. C., Hu, B. S., Kuo, B. I., Liu, C. Y., ... & Siu, L. K. (2002). A global emerging disease of *Klebsiella pneumoniae* liver abscess: is serotype K1 an important factor for complicated endophthalmitis?. *Gut*, *50*(3), 420-424.
- Gajdács, M., Ábrók, M., Lázár, A., & Burián, K. (2019). Comparative epidemiology and resistance trends of common urinary pathogens in a tertiary-care hospital: a 10-year surveillance study. *Medicina*, *55*(7), 356.
- Galani, I., Nafplioti, K., Adamou, P., Karaiskos, I., Giamarellou, H., & Souli, M. (2019). Nationwide epidemiology of carbapenem resistant *Klebsiella pneumoniae* isolates from Greek hospitals, with regards to plazomicin and aminoglycoside resistance. *BMC infectious diseases*, *19*(1), 1-12.
- Galimand, M., Courvalin, P., & Lambert, T. (2003). Plasmid-mediated high-level resistance to aminoglycosides in Enterobacteriaceae due to 16S rRNA methylation. *Antimicrobial agents and chemotherapy*, *47*(8), 2565-2571.

References

- Ghafur, A., Lakshmi, V., Kannain, P., Murali, A., & Thirunarayan, M. A. (2014). Emergence of Pan drug resistance amongst gram negative bacteria! The First case series from India. *Journal of Microbiology and Infectious Diseases*, 4(03), 86-91.
- Ghasemi, Y., Archin, T., Kargar, M., & Mohkam, M. (2013). A simple multiplex PCR for assessing prevalence of extended-spectrum β -lactamases producing *Klebsiella pneumoniae* in Intensive Care Units of a referral hospital in Shiraz, Iran. *Asian Pacific journal of tropical medicine*, 6(9), 703-708.
- Giakkoupi, P., Papagiannitsis, C. C., Miriagou, V., Pappa, O., Polemis, M., Tryfinopoulou, K., ... & Vatopoulos, A. C. (2011). An update of the evolving epidemic of bla KPC-2-carrying *Klebsiella pneumoniae* in Greece (2009–10). *Journal of Antimicrobial Chemotherapy*, 66(7), 1510-1513.
- Giske, C. G., Frödning, I., Hasan, C. M., Turlej-Rogacka, A., Toleman, M., Livermore, D., ... & Walsh, T. R. (2012). Diverse sequence types of *Klebsiella pneumoniae* contribute to the dissemination of bla NDM-1 in India, Sweden, and the United Kingdom. *Antimicrobial agents and chemotherapy*, 56(5), 2735-2738.
- Gona, F., Barbera, F., Pasquariello, A. C., Grossi, P., Gridelli, B., Mezzatesta, M. L., ... & Conaldi, P. G. (2014). In vivo multiclonal transfer of bla KPC-3 from *Klebsiella pneumoniae* to *Escherichia coli* in surgery patients. *Clinical Microbiology and Infection*, 20(10), O633-O635.
- Gorrie, C. L., Mirčeta, M., Wick, R. R., Edwards, D. J., Thomson, N. R., Strugnell, R. A., ... & Holt, K. E. (2017). Gastrointestinal carriage is a major reservoir of *Klebsiella pneumoniae* infection in intensive care patients. *Clinical infectious diseases*, 65(2), 208-215.
- Green, M. R., Hughes, H., Sambrook, J., & MacCallum, P. (2012). Molecular cloning: a laboratory manual. In *Molecular cloning: a laboratory manual* (pp. 1890-1890).
- Gu, D., Dong, N., Zheng, Z., Lin, D., Huang, M., Wang, L., ... & Chen, S. (2018). A fatal outbreak of ST11 carbapenem-resistant hypervirulent *Klebsiella pneumoniae* in a Chinese hospital: a molecular epidemiological study. *The Lancet infectious diseases*, 18(1), 37-46.
- Guducuoglu, H., Gursoy, N. C., Yakupogullari, Y., Parlak, M., Karasin, G., Sunnetcioglu, M., & Otlu, B. (2018). Hospital outbreak of a colistin-resistant, NDM-1-and OXA-48-producing *Klebsiella pneumoniae*: high mortality from pandrug resistance. *Microbial Drug Resistance*, 24(7), 966-972.
- Guo, L., An, J., Ma, Y., Ye, L., Luo, Y., Tao, C., & Yang, J. (2016). Nosocomial Outbreak of OXA-48-Producing *Klebsiella pneumoniae* in a Chinese Hospital: Clonal Transmission of ST147 and ST383. *PLoS one*, 11(8), e0160754.
- Hadano, Y. (2013). String test. *Case Reports*, 2013, bcr2012008328.
- Haines, M. E., Hodges, F. E., Nale, J. Y., Mahony, J., Van Sinderen, D., Kaczorowska, J., ... & Clokie, M. R. (2021). Analysis of selection methods to develop novel phage therapy cocktails against antimicrobial resistant clinical isolates of bacteria. *Frontiers in microbiology*, 12, 564.
- Harmsen, M., Lappann, M., Knöchel, S., & Molin, S. (2010). Role of extracellular DNA during biofilm formation by *Listeria monocytogenes*. *Applied and environmental microbiology*, 76(7), 2271.
- Hart, C. A. (2006). *Klebsiella*, *Citrobacter*, *Enterobacter* and *Serratia* spp. *Principles and practice of Clinical Bacteriology*, 377-386.
- Hawser, S. P., & Douglas, L. J. (1994). Biofilm formation by *Candida* species on the surface of catheter materials in vitro. *Infection and immunity*, 62(3), 915-921.
- He, J., Chen, D., & Chen, J. (2016). Comparative analyses of phenotypic methods and 16S rRNA, *khe*, *rpoB* genes sequencing for identification of clinical isolates of *Klebsiella pneumoniae*. *Antonie van Leeuwenhoek*, 109(7), 1029–1040.
- Henriksen, S. D. (1950). Mutative lactose fermentation in *Klebsiella*. *Acta Pathologica Microbiologica Scandinavica*, 27(1), 35-40.
- Hentschke, M., Wolters, M., Sobottka, I., Rohde, H., & Aepfelbacher, M. (2010). *ramR* mutations in clinical isolates of *Klebsiella pneumoniae* with reduced susceptibility to tigecycline. *Antimicrobial agents and chemotherapy*, 54(6), 2720-2723.
- Hesse, S., Malachowa, N., Porter, A. R., Freedman, B., Kobayashi, S. D., Gardner, D. J., ... & DeLeo, F. R. (2021). Bacteriophage Treatment Rescues Mice Infected with Multidrug-Resistant *Klebsiella pneumoniae* ST258. *Mbio*, 12(1), e00034-21.
- Hoeningl, M., Valentin, T., Zarfel, G., Wuerstl, B., Leitner, E., Salzer, H. J., ... & Grisold, A. J. (2012). Nosocomial outbreak of *Klebsiella pneumoniae* carbapenemase-producing *Klebsiella oxytoca* in Austria. *Antimicrobial agents and chemotherapy*, 56(4), 2158-2161.

- Høiby, N., Ciofu, O., Johansen, H. K., Song, Z. J., Moser, C., Jensen, P. Ø., Molin, S., Givskov, M., Tolker-Nielsen, T., & Bjarnsholt, T. (2011). The clinical impact of bacterial biofilms. *International journal of oral science*, 3(2), 55–65.
- Holt, K. E., Wertheim, H., Zadoks, R. N., Baker, S., Whitehouse, C. A., Dance, D., ... & Thomson, N. R. (2015). Genomic analysis of diversity, population structure, virulence, and antimicrobial resistance in *Klebsiella pneumoniae*, an urgent threat to public health. *Proceedings of the National Academy of Sciences*, 112(27), E3574-E3581.
- Hong, S. S., Kim, K., Huh, J. Y., Jung, B., Kang, M. S., & Hong, S. G. (2012). Multiplex PCR for rapid detection of genes encoding class A carbapenemases. *Annals of Laboratory Medicine*, 32(5), 359-361.
- Hsu, C. R., Lin, T. L., Chen, Y. C., Chou, H. C., & Wang, J. T. (2011). The role of *Klebsiella pneumoniae* rmpA in capsular polysaccharide synthesis and virulence revisited. *Microbiology*, 157(12), 3446-3457.
- Hu, W., Li, L., Sharma, S., Wang, J., McHardy, I., Lux, R., Yang, Z., He, X., Gimzewski, J. K., Li, Y., & Shi, W. (2012). DNA builds and strengthens the extracellular matrix in *Myxococcus xanthus* biofilms by interacting with exopolysaccharides. *PLoS one*, 7(12), e51905.
- Hudson, C. M., Bent, Z. W., Meagher, R. J., & Williams, K. P. (2014). Resistance determinants and mobile genetic elements of an NDM-1-encoding *Klebsiella pneumoniae* strain. *PLoS one*, 9(6), e99209.
- Huseby, M. J., Kruse, A. C., Digre, J., Kohler, P. L., Vocke, J. A., Mann, E. E., Bayles, K. W., Bohach, G. A., Schlievert, P. M., Ohlendorf, D. H., & Earhart, C. A. (2010). Beta toxin catalyzes formation of nucleoprotein matrix in staphylococcal biofilms. *Proceedings of the National Academy of Sciences of the United States of America*, 107(32), 14407–14412.
- Ikeda, M., Mizoguchi, M., Oshida, Y., Tatsuno, K., Saito, R., Okazaki, M., Okugawa, S., & Moriya, K. (2018). Clinical and microbiological characteristics and occurrence of *Klebsiella pneumoniae* infection in Japan. *International journal of general medicine*, 11, 293–299.
- Jacquier, H., Le Monnier, A., Carbone, E., Corvec, S., Illiaquer, M., Bille, E., ... & Cattoir on Behalf of the GMC Study Group, V. (2012). In vitro antimicrobial activity of “last-resort” antibiotics against unusual nonfermenting Gram-negative bacilli clinical isolates. *Microbial drug resistance*, 18(4), 396-401.
- Jaggi, N., Chatterjee, N., Singh, V., Giri, S. K., Dwivedi, P., Panwar, R., & Sharma, A. P. (2019). Carbapenem resistance in *Escherichia coli* and *Klebsiella pneumoniae* among Indian and international patients in North India. *Acta microbiologica et immunologica Hungarica*, 66(3), 367-376.
- Jakubovics, N. S., Shields, R. C., Rajarajan, N., & Burgess, J. G. (2013). Life after death: the critical role of extracellular DNA in microbial biofilms. *Letters in applied microbiology*, 57(6), 467-475.
- Jamal, M., Ahmad, W., Andleeb, S., Jalil, F., Imran, M., Nawaz, M. A., ... & Kamil, M. A. (2018). Bacterial biofilm and associated infections. *Journal of the Chinese Medical Association*, 81(1), 7-11.
- Jean, S. S., Coombs, G., Ling, T., Balaji, V., Rodrigues, C., Mikamo, H., ... & Kiratisin, P. (2016). Epidemiology and antimicrobial susceptibility profiles of pathogens causing urinary tract infections in the Asia-Pacific region: Results from the Study for Monitoring Antimicrobial Resistance Trends (SMART), 2010–2013. *International journal of antimicrobial agents*, 47(4), 328-334.
- Jensen, T. S., Opstrup, K. V., Christiansen, G., Rasmussen, P. V., Thomsen, M. E., Justesen, D. L., Schönheyder, H. C., Lausen, M., & Birkelund, S. (2020). Complement mediated *Klebsiella pneumoniae* capsule changes. *Microbes and infection*, 22(1), 19–30.
- Jeon, J. H., Lee, J. H., Lee, J. J., Park, K. S., Karim, A. M., Lee, C. R., ... & Lee, S. H. (2015). Structural basis for carbapenem-hydrolyzing mechanisms of carbapenemases conferring antibiotic resistance. *International journal of molecular sciences*, 16(5), 9654-9692.
- JEong, E. S., Lee, K. S., HEo, S. H., SEo, J. H., & CHoi, Y. K. (2013). Rapid identification of *Klebsiella pneumoniae*, *Corynebacterium kutscheri*, and *Streptococcus pneumoniae* using triplex polymerase chain reaction in rodents. *Experimental animals*, 62(1), 35-40.
- Jolley, K. A., & Maiden, M. C. (2010). BIGSdb: scalable analysis of bacterial genome variation at the population level. *BMC bioinformatics*, 11(1), 1-11.
- Jonas, D., Spitzmüller, B., Daschner, F. D., Verhoef, J., & Brisse, S. (2004). Discrimination of *Klebsiella pneumoniae* and *Klebsiella oxytoca* phylogenetic groups and other *Klebsiella* species by use of amplified fragment length polymorphism. *Research in Microbiology*, 155(1), 17-23.
- Jones, L. A., McIver, C. J., Kim, M. J., Rawlinson, W. D., & White, P. A. (2005). The aadB gene cassette is associated with bla SHV genes in *Klebsiella* species producing extended-spectrum β -lactamases. *Antimicrobial agents and chemotherapy*, 49(2), 794-797.

References

- Juarez, G. E., & Galván, E. M. (2018). Role of nutrient limitation in the competition between uropathogenic strains of *Klebsiella pneumoniae* and *Escherichia coli* in mixed biofilms. *Biofouling*, *34*(3), 287-298.
- Kaas, R. S., Leekitcharoenphon, P., Aarestrup, F. M., & Lund, O. (2014). Solving the problem of comparing whole bacterial genomes across different sequencing platforms. *PloS one*, *9*(8), e104984.
- Karampatakis, T., Antachopoulos, C., Iosifidis, E., Tsakris, A., & Roilides, E. (2016). Molecular epidemiology of carbapenem-resistant *Klebsiella pneumoniae* in Greece. *Future microbiology*, *11*(6), 809-823.
- Karimi, K., Zarei, O., Sedighi, P., Taheri, M., Doosti-Irani, A., & Shokoohzadeh, L. (2021). Investigation of Antibiotic Resistance and Biofilm Formation in Clinical Isolates of *Klebsiella pneumoniae*. *International Journal of Microbiology*, 2021.
- Karkey, A., Thanh, D. P., Boinett, C. J., Cain, A. K., Ellington, M., Baker, K. S., ... & Phuong, T. L. T. (2015). A high-resolution genomic analysis of multidrug-resistant hospital outbreaks of *Klebsiella pneumoniae*. *EMBO molecular medicine*, *7*(3), 227-239.
- Karki, D., Dhungel, B., Bhandari, S., Kunwar, A., Joshi, P. R., Shrestha, B., ... & Banjara, M. R. (2021). Antibiotic resistance and detection of plasmid mediated colistin resistance *mcr-1* gene among *Escherichia coli* and *Klebsiella pneumoniae* isolated from clinical samples. *Gut pathogens*, *13*(1), 1-16.
- Karki, D., Dhungel, B., Bhandari, S., Kunwar, A., Joshi, P. R., Shrestha, B., ... & Banjara, M. R. (2021). Antibiotic resistance and detection of plasmid mediated colistin resistance *mcr-1* gene among *Escherichia coli* and *Klebsiella pneumoniae* isolated from clinical samples. *Gut pathogens*, *13*(1), 1-16.
- Kazi, M., Drego, L., Nikam, C., Ajbani, K., Soman, R., Shetty, A., & Rodrigues, C. (2015). Molecular characterization of carbapenem-resistant Enterobacteriaceae at a tertiary care laboratory in Mumbai. *European Journal of Clinical Microbiology & Infectious Diseases*, *34*(3), 467-472.
- Khodadadian, R., Rahdar, H. A., Javadi, A., Safari, M., & Khorshidi, A. (2018). Detection of VIM-1 and IMP-1 genes in *Klebsiella pneumoniae* and relationship with biofilm formation. *Microbial pathogenesis*, *115*, 25-30.
- Khorvash, F., Yazdani, M. R., Soudi, A. A., Shabani, S., & Tavahen, N. (2017). Prevalence of acquired carbapenemase genes in *Klebsiella pneumoniae* by multiplex PCR in Isfahan. *Advanced biomedical research*, *6*.
- Kitchel, B., Rasheed, J. K., Patel, J. B., Srinivasan, A., Navon-Venezia, S., Carmeli, Y., ... & Giske, C. G. (2009). Molecular epidemiology of KPC-producing *Klebsiella pneumoniae* isolates in the United States: clonal expansion of multilocus sequence type 258. *Antimicrobial agents and chemotherapy*, *53*(8), 3365-3370.
- Köck, R., Daniels-Haardt, I., Becker, K., Mellmann, A., Friedrich, A. W., Mevius, D., ... & Jurke, A. (2018). Carbapenem-resistant Enterobacteriaceae in wildlife, food-producing, and companion animals: a systematic review. *Clinical microbiology and infection*, *24*(12), 1241-1250.
- Koo, H., & Yamada, K. M. (2016). Dynamic cell-matrix interactions modulate microbial biofilm and tissue 3D microenvironments. *Current opinion in cell biology*, *42*, 102-112.
- Kor, S. B., Choo, Q. C., & Chew, C. H. (2013). New integron gene arrays from multiresistant clinical isolates of members of the Enterobacteriaceae and *Pseudomonas aeruginosa* from hospitals in Malaysia. *Journal of medical microbiology*, *62*(3), 412-420.
- Kotb, D. N., Mahdy, W. K., Mahmoud, M. S., & Khairy, R. M. (2019). Impact of co-existence of PMQR genes and QRDR mutations on fluoroquinolones resistance in Enterobacteriaceae strains isolated from community and hospital acquired UTIs. *BMC infectious diseases*, *19*(1), 1-8.
- Kozak, G. K., Boerlin, P., Janecko, N., Reid-Smith, R. J., & Jardine, C. (2009). Antimicrobial resistance in *Escherichia coli* isolates from swine and wild small mammals in the proximity of swine farms and in natural environments in Ontario, Canada. *Applied and Environmental Microbiology*, *75*(3), 559-566.
- Krapp, F., Morris, A. R., Ozer, E. A., & Hauser, A. R. (2017). Virulence characteristics of carbapenem-resistant *Klebsiella pneumoniae* strains from patients with necrotizing skin and soft tissue infections. *Scientific reports*, *7*(1), 1-14.
- Krause, K. M., Serio, A. W., Kane, T. R., & Connolly, L. E. (2016). Aminoglycosides: an overview. *Cold Spring Harbor perspectives in medicine*, *6*(6), a027029.
- Kristensen, M. (1948). Mutative bacterial fermentation. *Acta Pathologica Microbiologica Scandinavica*, *25*(1-2), 244-248.

- Ku, Y. H., Chuang, Y. C., & Yu, W. L. (2008). Clinical spectrum and molecular characteristics of *Klebsiella pneumoniae* causing community-acquired extrahepatic abscess. *J Microbiol Immunol Infect*, *41*(4), 311-317.
- Kumar, A. S., Mody, K., & Jha, B. (2007). Bacterial exopolysaccharides--a perception. *Journal of basic microbiology*, *47*(2), 103-117.
- Lai, Y. C., Peng, H. L., & Chang, H. Y. (2003). RmpA2, an activator of capsule biosynthesis in *Klebsiella pneumoniae* CG43, regulates K2 cps gene expression at the transcriptional level. *Journal of bacteriology*, *185*(3), 788-800.
- Lalaoui, R., Bakour, S., Livnat, K., Assous, M. V., Diene, S. M., & Rolain, J. M. (2019). Spread of carbapenem and colistin-resistant *Klebsiella pneumoniae* ST512 clinical isolates in Israel: a cause for vigilance. *Microbial Drug Resistance*, *25*(1), 63-71.
- Lam, M. M., Wick, R. R., Wyres, K. L., Gorrie, C. L., Judd, L. M., Jenney, A. W., ... & Holt, K. E. (2018). Genetic diversity, mobilisation and spread of the yersiniabactin-encoding mobile element ICEKp in *Klebsiella pneumoniae* populations. *Microbial genomics*, *4*(9).
- Lan, P., Yan, R., Lu, Y., Zhao, D., Shi, Q., Jiang, Y., ... & Zhou, J. (2021). Genetic diversity of siderophores and hypermucoviscosity phenotype in *Klebsiella pneumoniae*. *Microbial Pathogenesis*, 105014.
- Lascols, C., Hackel, M., Marshall, S. H., Hujer, A. M., Bouchillon, S., Badal, R., ... & Bonomo, R. A. (2011). Increasing prevalence and dissemination of NDM-1 metallo- β -lactamase in India: data from the SMART study (2009). *Journal of Antimicrobial Chemotherapy*, *66*(9), 1992-1997.
- Lascols, C., Peirano, G., Hackel, M., Laupland, K. B., & Pitout, J. D. (2013). Surveillance and molecular epidemiology of *Klebsiella pneumoniae* isolates that produce carbapenemases: first report of OXA-48-like enzymes in North America. *Antimicrobial agents and chemotherapy*, *57*(1), 130-136.
- Lawlor, M. S., Handley, S. A., & Miller, V. L. (2006). Comparison of the host responses to wild-type and cpsB mutant *Klebsiella pneumoniae* infections. *Infection and immunity*, *74*(9), 5402-5407.
- Lawlor, M. S., O'connor, C., & Miller, V. L. (2007). Yersiniabactin is a virulence factor for *Klebsiella pneumoniae* during pulmonary infection. *Infection and immunity*, *75*(3), 1463-1472.
- Lázaro-Perona, F., Sotillo, A., Troyano-Hernández, P., Gómez-Gil, R., de la Vega-Bueno, Á., & Mingorance, J. (2018). Genomic path to pandrug resistance in a clinical isolate of *Klebsiella pneumoniae*. *International journal of antimicrobial agents*, *52*(5), 713-718.
- Leavitt, A., Chmelnitsky, I., Carmeli, Y., & Navon-Venezia, S. (2010). Complete nucleotide sequence of KPC-3-encoding plasmid pKpQIL in the epidemic *Klebsiella pneumoniae* sequence type 258. *Antimicrobial agents and chemotherapy*, *54*(10), 4493-4496.
- Lederman, E. R., & Crum, N. F. (2005). Pyogenic liver abscess with a focus on *Klebsiella pneumoniae* as a primary pathogen: an emerging disease with unique clinical characteristics. *Official journal of the American College of Gastroenterology| ACG*, *100*(2), 322-331.
- Lee, C. R., Lee, J. H., Park, K. S., Kim, Y. B., Jeong, B. C., & Lee, S. H. (2016). Global dissemination of carbapenemase-producing *Klebsiella pneumoniae*: epidemiology, genetic context, treatment options, and detection methods. *Frontiers in microbiology*, *7*, 895.
- Lee, K. H., Park, S. J., Choi, S., Uh, Y., Park, J. Y., & Han, K. H. (2017). The influence of urinary catheter materials on forming biofilms of microorganisms. *Journal of Bacteriology and Virology*, *47*(1), 32-40.
- Lee, K., Yum, J. H., Yong, D., Lee, H. M., Kim, H. D., Docquier, J. D., Rossolini, G. M., & Chong, Y. (2005). Novel acquired metallo-beta-lactamase gene, bla(SIM-1), in a class 1 integron from *Acinetobacter baumannii* clinical isolates from Korea. *Antimicrobial agents and chemotherapy*, *49*(11), 4485-4491.
- Lenchenko, E., Blumenkrants, D., Sachivkina, N., Shadrova, N., & Ibragimova, A. (2020). Morphological and adhesive properties of *Klebsiella pneumoniae* biofilms. *Veterinary world*, *13*(1), 197.
- Letunic, I., & Bork, P. (2019). Interactive Tree Of Life (iTOL) v4: recent updates and new developments. *Nucleic acids research*, *47*(W1), W256-W259.
- Lewis, K. (2008). Multidrug tolerance of biofilms and persister cells. *Bacterial biofilms*, 107-131.
- Lewis, R., Clooney, A. G., Stockdale, S. R., Buttimer, C., Draper, L. A., Ross, R. P., & Hill, C. (2020). Isolation of a novel jumbo bacteriophage effective against *Klebsiella aerogenes*. *Frontiers in medicine*, *7*, 67.
- Li, B., Zhao, Y., Liu, C., Chen, Z., & Zhou, D. (2014). Molecular pathogenesis of *Klebsiella pneumoniae*. *Future microbiology*, *9*(9), 1071-1081.
- Li, M., Li, P., Chen, L., Guo, G., Xiao, Y., Chen, L., ... & Zhang, W. (2021). Identification of a phage-derived

References

- depolymerase specific for KL64 capsule of *Klebsiella pneumoniae* and its anti-biofilm effect. *Virus Genes*, 1-9.
- Li, P., Zhang, D., Li, H., Pang, J., Guo, H., & Qiu, J. (2020). Establishment and Application of Multiplex PCR for Simultaneously Detecting *Escherichia coli*, *Salmonella*, *Klebsiella pneumoniae*, and *Staphylococcus aureus* in Minks. *Frontiers in Veterinary Science*, 7, 948.
- Li, W., Sun, G., Yu, Y., Li, N., Chen, M., Jin, R., ... & Wu, H. (2014). Increasing occurrence of antimicrobial-resistant hypervirulent (hypermucoviscous) *Klebsiella pneumoniae* isolates in China. *Clinical infectious diseases*, 58(2), 225-232.
- Liapis, E., Pantel, A., Robert, J., Nicolas-Chanoine, M. H., Cavalié, L., van der Mee-Marquet, N., ... & ONERBA. (2014). Molecular epidemiology of OXA-48-producing *Klebsiella pneumoniae* in France. *Clinical Microbiology and Infection*, 20(12), O1121-O1123.
- Lin, J. C., Chang, F. Y., Fung, C. P., Xu, J. Z., Cheng, H. P., Wang, J. J., ... & Siu, L. K. (2004). High prevalence of phagocytic-resistant capsular serotypes of *Klebsiella pneumoniae* in liver abscess. *Microbes and infection*, 6(13), 1191-1198.
- Lin, T. H., Wu, C. C., Kuo, J. T., Chu, H. F., Lee, D. Y., & Lin, C. T. (2019). FNR-Dependent RmpA and RmpA2 Regulation of Capsule Polysaccharide Biosynthesis in *Klebsiella pneumoniae*. *Frontiers in microbiology*, 10, 2436.
- Lin, T. L., Lee, C. Z., Hsieh, P. F., Tsai, S. F., & Wang, J. T. (2008). Characterization of integrative and conjugative element ICE Kp1-associated genomic heterogeneity in a *Klebsiella pneumoniae* strain isolated from a primary liver abscess. *Journal of bacteriology*, 190(2), 515-526.
- Lin, Y. C., Lu, M. C., Tang, H. L., Liu, H. C., Chen, C. H., Liu, K. S., ... & Lai, Y. C. (2011). Assessment of hypermucoviscosity as a virulence factor for experimental *Klebsiella pneumoniae* infections: comparative virulence analysis with hypermucoviscosity-negative strain. *BMC microbiology*, 11(1), 1-8.
- Ling, M. L., Tee, Y. M., Tan, S. G., Amin, I. M., How, K. B., Tan, K. Y., & Lee, L. C. (2015). Risk factors for acquisition of carbapenem resistant Enterobacteriaceae in an acute tertiary care hospital in Singapore. *Antimicrobial resistance and infection control*, 4(1), 1-7.
- Lippa, A. M., & Goulian, M. (2009). Feedback inhibition in the PhoQ/PhoP signaling system by a membrane peptide. *PLoS Genet*, 5(12), e1000788.
- Liu, C., & Guo, J. (2019). Hypervirulent *Klebsiella pneumoniae* (hypermucoviscous and aerobactin positive) infection over 6 years in the elderly in China: antimicrobial resistance patterns, molecular epidemiology and risk factor. *Annals of clinical microbiology and antimicrobials*, 18(1), 1-11.
- Liu, C., Du, P., Xiao, N., Ji, F., Russo, T. A., & Guo, J. (2020). Hypervirulent *Klebsiella pneumoniae* is emerging as an increasingly prevalent *K. pneumoniae* pathotype responsible for nosocomial and healthcare-associated infections in Beijing, China. *Virulence*, 11(1), 1215-1224.
- Liu, X., Sai, F., Li, L., Zhu, C., & Huang, H. (2020). Clinical characteristics and risk factors of catheter-associated urinary tract infections caused by *Klebsiella pneumoniae*. *Annals of Palliative Medicine*.
- Liu, Y. Y., Wang, Y., Walsh, T. R., Yi, L. X., Zhang, R., Spencer, J., ... & Shen, J. (2016). Emergence of plasmid-mediated colistin resistance mechanism MCR-1 in animals and human beings in China: a microbiological and molecular biological study. *The Lancet infectious diseases*, 16(2), 161-168.
- Lo, E., Nicolle, L. E., Coffin, S. E., Gould, C., Maragakis, L. L., Meddings, J., ... & Yokoe, D. S. (2014). Strategies to prevent catheter-associated urinary tract infections in acute care hospitals: 2014 update. *Infection Control & Hospital Epidemiology*, 35(S2), S32-S47.
- Long, S. W., Linson, S. E., Ojeda Saavedra, M., Cantu, C., Davis, J. J., Brettin, T., & Olsen, R. J. (2017). Whole-genome sequencing of human clinical *Klebsiella pneumoniae* isolates reveals misidentification and misunderstandings of *Klebsiella pneumoniae*, *Klebsiella variicola*, and *Klebsiella quasipneumoniae*. *MSphere*, 2(4), e00290-17.
- Long, S. W., Olsen, R. J., Eagar, T. N., Beres, S. B., Zhao, P., Davis, J. J., Brettin, T., Xia, F., & Musser, J. M. (2017). Population Genomic Analysis of 1,777 Extended-Spectrum Beta-Lactamase-Producing *Klebsiella pneumoniae* Isolates, Houston, Texas: Unexpected Abundance of Clonal Group 307. *mBio*, 8(3), e00489-17.
- Lunha, K., Chanawong, A., Lulitanond, A., Wilailuckana, C., Charoensri, N., Wonglakorn, L., ... & Chetchotisakd, P. (2016). High-level carbapenem-resistant OXA-48-producing *Klebsiella pneumoniae* with a novel OmpK36 variant and low-level, carbapenem-resistant, non-porin-deficient, OXA-181-

- producing *Escherichia coli* from Thailand. *Diagnostic microbiology and infectious disease*, 85(2), 221-226.
- Luo, Q., Wang, Y., & Xiao, Y. (2020). Prevalence and transmission of mobilized colistin resistance (*mcr*) gene in bacteria common to animals and humans. *Biosafety and Health*, 2(2), 71-78.
- Luo, Y., Wang, Y., Ye, L., & Yang, J. (2014). Molecular epidemiology and virulence factors of pyogenic liver abscess causing *Klebsiella pneumoniae* in China. *Clinical Microbiology and Infection*, 20(11), O818-O824.
- Ma, L., Wang, J. T., Wu, T. L., Siu, L. K., Chuang, Y. C., Lin, J. C., ... & Lu, P. L. (2015). Emergence of OXA-48-producing *Klebsiella pneumoniae* in Taiwan. *PLoS One*, 10(9), e0139152.
- Maatallah, M., Vading, M., Kabir, M. H., Bakhrouf, A., Kalin, M., Naucler, P., ... & Giske, C. G. (2014). *Klebsiella variicola* is a frequent cause of bloodstream infection in the Stockholm area, and associated with higher mortality compared to *K. pneumoniae*. *PloS one*, 9(11), e113539.
- Macleod, S. M., & Stickler, D. J. (2007). Species interactions in mixed-community crystalline biofilms on urinary catheters. *Journal of medical microbiology*, 56(11), 1549-1557.
- Madsen, J. S., Lin, Y. C., Squyres, G. R., Price-Whelan, A., de Santiago Torio, A., Song, A., ... & Dietrich, L. E. (2015). Facultative control of matrix production optimizes competitive fitness in *Pseudomonas aeruginosa* PA14 biofilm models. *Applied and environmental microbiology*, 81(24), 8414.
- Magiorakos, A. P., Srinivasan, A., Carey, R. T., Carmeli, Y., Falagas, M. T., Giske, C. T., ... & Monnet, D. T. (2012). Multidrug-resistant, extensively drug-resistant and pandrug-resistant bacteria: an international expert proposal for interim standard definitions for acquired resistance. *Clinical microbiology and infection*, 18(3), 268-281.
- Maione, A., de Alteriis, E., Carraturo, F., Galdiero, S., Falanga, A., Guida, M., ... & Galdiero, E. (2021). The Membranotropic Peptide gH625 to Combat Mixed *Candida albicans*/*Klebsiella pneumoniae* Biofilm: Correlation between In Vitro Anti-Biofilm Activity and In Vivo Antimicrobial Protection. *Journal of Fungi*, 7(1), 26.
- Mancini, S., Poirel, L., Tritten, M. L., Lienhard, R., Bassi, C., & Nordmann, P. (2018). Emergence of an MDR *Klebsiella pneumoniae* ST231 producing OXA-232 and RmtF in Switzerland. *Journal of Antimicrobial Chemotherapy*, 73(3), 821-823.
- Maneval, W. E. (1941). Staining bacteria and yeasts with acid dyes. *Stain Technology*, 16(1), 13-19.
- March, C., Cano, V., Moranta, D., Llobet, E., Pérez-Gutiérrez, C., Tomás, J. M., ... & Bengoechea, J. A. (2013). Role of bacterial surface structures on the interaction of *Klebsiella pneumoniae* with phagocytes. *PLoS one*, 8(2), e56847.
- Markovska, R., Schneider, I., Ivanova, D., Mitov, I., & Bauernfeind, A. (2014). Predominance of IncL/M and IncF plasmid types among CTX-M-ESBL-producing *Escherichia coli* and *Klebsiella pneumoniae* in Bulgarian hospitals. *Apmis*, 122(7), 608-615.
- Martin, R. M., & Bachman, M. A. (2018). Colonization, infection, and the accessory genome of *Klebsiella pneumoniae*. *Frontiers in cellular and infection microbiology*, 8, 4.
- Martins, M., McCusker, M. P., Viveiros, M., Couto, I., Fanning, S., Pagès, J. M., & Amaral, L. (2013). A Simple Method for Assessment of MDR Bacteria for Over-Expressed Efflux Pumps. *The open microbiology journal*, 7, 72-82.
- Massé, J., Dufour, S., & Archambault, M. (2020). Characterization of *Klebsiella* isolates obtained from clinical mastitis cases in dairy cattle. *Journal of dairy science*, 103(4), 3392-3400.
- Mataseje, L. F., Boyd, D. A., Fuller, J., Haldane, D., Hoang, L., Lefebvre, B., ... & Mulvey, M. R. (2018). Characterization of OXA-48-like carbapenemase producers in Canada, 2011-14. *Journal of Antimicrobial Chemotherapy*, 73(3), 626-633.
- Matsen, J. M., & Blazevic, D. J. (1969). Characterization of ornithine decarboxylase-positive, nonmotile strains of the *Klebsiella-Enterobacter* group. *Applied Microbiology*, 18(4), 566-569.
- Matuschek, E., Åhman, J., Webster, C., & Kahlmeter, G. (2018). Antimicrobial susceptibility testing of colistin—evaluation of seven commercial MIC products against standard broth microdilution for *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Acinetobacter* spp. *Clinical Microbiology and Infection*, 24(8), 865-870.
- Maunder, E., & Welch, M. (2017). Matrix exopolysaccharides; the sticky side of biofilm formation. *FEMS microbiology letters*, 364(13).

References

- McNally, A., Thomson, N. R., Reuter, S., & Wren, B. W. (2016). 'Add, stir and reduce': *Yersinia* spp. as model bacteria for pathogen evolution. *Nature Reviews Microbiology*, *14*(3), 177-190.
- Meletis, G. (2016). Carbapenem resistance: overview of the problem and future perspectives. *Therapeutic advances in infectious disease*, *3*(1), 15-21.
- Mendelson G., Hait V., Ben-Israel J., Gronich D., Granot E., & Raz R. (2005). Prevalence and risk factors of extended-spectrum beta-lactamase-producing *Escherichia coli* and *Klebsiella pneumoniae* in an Israeli long-term care facility. *European journal of clinical microbiology and infectious diseases*, *24*(1), 17-22.
- Mirzaii, M., Jamshidi, S., Zamanzadeh, M., Marashifard, M., Hosseini, S. A. A. M., Haeili, M., ... & Khoramrooz, S. S. (2018). Determination of *gyrA* and *parC* mutations and prevalence of plasmid-mediated quinolone resistance genes in *Escherichia coli* and *Klebsiella pneumoniae* isolated from patients with urinary tract infection in Iran. *Journal of global antimicrobial resistance*, *13*, 197-200.
- Møller, T. S., Overgaard, M., Nielsen, S. S., Bortolaia, V., Sommer, M. O., Guardabassi, L., & Olsen, J. E. (2016). Relation between *tetR* and *tetA* expression in tetracycline resistant *Escherichia coli*. *BMC microbiology*, *16*(1), 1-8.
- Molton, J. S., Tambyah, P. A., Ang, B. S., Ling, M. L., & Fisher, D. A. (2013). The global spread of healthcare-associated multidrug-resistant bacteria: a perspective from Asia. *Clinical infectious diseases*, *56*(9), 1310-1318.
- Momin, M. H. F. A., Liakopoulos, A., Phee, L. M., & Wareham, D. W. (2017). Emergence and nosocomial spread of carbapenem-resistant OXA-232-producing *Klebsiella pneumoniae* in Brunei Darussalam. *Journal of global antimicrobial resistance*, *9*, 96-99.
- Montanaro, L., Poggi, A., Visai, L., Ravaoli, S., Campoccia, D., Speziale, P., & Arciola, C. R. (2011). Extracellular DNA in biofilms. *The International journal of artificial organs*, *34*(9), 824-831.
- Montminy, S. W., Khan, N., McGrath, S., Walkowicz, M. J., Sharp, F., Conlon, J. E., ... & Lien, E. (2006). Virulence factors of *Yersinia pestis* are overcome by a strong lipopolysaccharide response. *Nature immunology*, *7*(10), 1066-1073.
- Mori, M., Ohta, M., Agata, N., Kido, N., Arakawa, Y., Ito, H., ... & Kato, N. (1989). Identification of species and capsular types of *Klebsiella* clinical isolates, with special reference to *Klebsiella planticola*. *Microbiology and immunology*, *33*(11), 887-895.
- Muhsin, J., Wisal, A., Saadia, A., Fazal, J., Muhammad, I., Muhammad, A. N., ... & Muhammad, A. K. (2018). Bacterial biofilm and associated infections. *Journal of the Chinese Medical Association*, *81*(1), 7-11.
- Müller, S. I., Valdebenito, M., & Hantke, K. (2009). Salmochelin, the long-overlooked catecholate siderophore of *Salmonella*. *Biometals*, *22*(4), 691-695.
- Munoz-Price, L. S., Poirel, L., Bonomo, R. A., Schwaber, M. J., Daikos, G. L., Cormican, M., Cornaglia, G., Garau, J., Gniadkowski, M., Hayden, M. K., Kumarasamy, K., Livermore, D. M., Maya, J. J., Nordmann, P., Patel, J. B., Paterson, D. L., Pitout, J., Villegas, M. V., Wang, H., Woodford, N., ... Quinn, J. P. (2013). Clinical epidemiology of the global expansion of *Klebsiella pneumoniae* carbapenemases. *The Lancet. Infectious diseases*, *13*(9), 785-796.
- Murphy, K., & Weaver, C. (2016). *Janeway's immunobiology*. Garland science.
- Nagano, N., Cordevant, C., & Nagano, Y. (2008). Upper and lower urinary tract infection caused by *Klebsiella pneumoniae* serotype K2 and CTX-M-15 beta-lactamase-producing serotype K1: a case report and characterization of serum killing resistance. *Journal of medical microbiology*, *57*(Pt 1), 121-124.
- Naha, S., Sands, K., Mukherjee, S., Saha, B., Dutta, S., & Basu, S. (2021). OXA-181-Like Carbapenemases in *Klebsiella pneumoniae* ST14, ST15, ST23, ST48, and ST231 from Septicemic Neonates: Coexistence with NDM-5, Resistome, Transmissibility, and Genome Diversity. *mSphere*, *6*(1), e01156-20. <https://doi.org/10.1128/mSphere.01156-20>
- Nahid, F., Zahra, R., & Sandegren, L. (2017). A bla OXA-181-harboring multi-resistant ST147 *Klebsiella pneumoniae* isolate from Pakistan that represent an intermediate stage towards pan-drug resistance. *PLoS One*, *12*(12), e0189438.
- Nassif, X. A. V. I. E. R., Fournier, J. M., Arondel, J., & Sansonetti, P. J. (1989). Mucoid phenotype of *Klebsiella pneumoniae* is a plasmid-encoded virulence factor. *Infection and immunity*, *57*(2), 546.
- Navon-Venezia, S., Kondratyeva, K., & Carattoli, A. (2017). *Klebsiella pneumoniae*: a major worldwide source and shuttle for antibiotic resistance. *FEMS microbiology reviews*, *41*(3), 252-275.

- Nicolau Korres, A. M., Aquije, G. M., Buss, D. S., Ventura, J. A., Fernandes, P. M., & Fernandes, A. A. (2013). Comparison of biofilm and attachment mechanisms of a phytopathological and clinical isolate of *Klebsiella pneumoniae* Subsp. *pneumoniae*. *TheScientificWorldJournal*, 2013, 925375.
- Nicolle L. E. (2014). Catheter associated urinary tract infections. *Antimicrobial resistance and infection control*, 3, 23.
- Niveditha, S., Pramodhini, S., Umadevi, S., Kumar, S., & Stephen, S. (2012). The isolation and the biofilm formation of uropathogens in the patients with catheter associated urinary tract infections (UTIs). *Journal of clinical and diagnostic research: JCDR*, 6(9), 1478.
- Noguchi, N., Katayama, J., & O'Hara, K. (1996). Cloning and nucleotide sequence of the mphB gene for macrolide 2'-phosphotransferase II in *Escherichia coli*. *FEMS microbiology letters*, 144(2-3), 197-202.
- Nordmann, P., & Poirel, L. (2014). The difficult-to-control spread of carbapenemase producers among Enterobacteriaceae worldwide. *Clinical Microbiology and Infection*, 20(9), 821-830.
- Nordmann, P., Naas, T., & Poirel, L. (2011). Global spread of Carbapenemase-producing Enterobacteriaceae. *Emerging infectious diseases*, 17(10), 1791-1798.
- Nordmann, P., Poirel, L., Walsh, T. R., & Livermore, D. M. (2011). The emerging NDM carbapenemases. *Trends in microbiology*, 19(12), 588-595.
- Ocampo, A. M., Chen, L., Cienfuegos, A. V., Roncancio, G., Chavda, K. D., Kreiswirth, B. N., & Jiménez, J. N. (2016). A two-year surveillance in five Colombian tertiary care hospitals reveals high frequency of non-CG258 clones of carbapenem-resistant *Klebsiella pneumoniae* with distinct clinical characteristics. *Antimicrobial agents and chemotherapy*, 60(1), 332-342.
- Odsbu, I., Khedkar, S., Lind, F., Khedkar, U., Nerkar, S. S., Orsini, N., Tamhankar, A. J., & Stålsby Lundborg, C. (2018). Trends in Resistance to Extended-Spectrum Cephalosporins and Carbapenems among *Escherichia coli* and *Klebsiella* spp. Isolates in a District in Western India during 2004-2014. *International journal of environmental research and public health*, 15(1), 155.
- Ojo, K. K., Ulep, C., Van Kirk, N., Luis, H., Bernardo, M., Leitao, J., & Roberts, M. C. (2004). The *mef* (A) gene predominates among seven macrolide resistance genes identified in gram-negative strains representing 13 genera, isolated from healthy Portuguese children. *Antimicrobial agents and chemotherapy*, 48(9), 3451-3456.
- Okshevsky, M., & Meyer, R. L. (2015). The role of extracellular DNA in the establishment, maintenance and perpetuation of bacterial biofilms. *Critical reviews in microbiology*, 41(3), 341-352.
- Olewi, S. R., & Abid, H. K. (2017). Role of Extracted Genomic DNA on Biofilm Formation by *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* in vitro. *Ibn AL-Haitham Journal For Pure and Applied Science*, 27(3), 34-44.
- Oloomi, M., Javadi, M., Karam, M. R. A., Khezerloo, J. K., Haghri, Z., & Bouzari, S. (2020). Protective multi-epitope candidate vaccine for urinary tract infection. *Biotechnology Reports*, 28, e00564.
- Ong, C. L., Ulett, G. C., Mabbett, A. N., Beatson, S. A., Webb, R. I., Monaghan, W., Nimmo, G. R., Looke, D. F., McEwan, A. G., & Schembri, M. A. (2008). Identification of type 3 fimbriae in uropathogenic *Escherichia coli* reveals a role in biofilm formation. *Journal of bacteriology*, 190(3), 1054-1063.
- Opoku-Temeng, C., Kobayashi, S. D., & DeLeo, F. R. (2019). *Klebsiella pneumoniae* capsule polysaccharide as a target for therapeutics and vaccines. *Computational and structural biotechnology journal*, 17, 1360-1366.
- Osman, E. A., El-Amin, N., Adrees, E., Al-Hassan, L., & Mukhtar, M. (2020). Comparing conventional, biochemical and genotypic methods for accurate identification of *Klebsiella pneumoniae* in Sudan. *Access microbiology*, 2(3), acmi000096.
- Ostapska, H., Howell, P. L., & Sheppard, D. C. (2018). Deacetylated microbial biofilm exopolysaccharides: It pays to be positive. *PLoS pathogens*, 14(12), e1007411.
- Ostria-Hernandez, M. L., Juárez-de la Rosa, K. C., Arzate-Barbosa, P., Lara-Hernández, A., Sakai, F., Ibarra, J. A., ... & Vidal, J. E. (2018). Nosocomial, multidrug-resistant *Klebsiella pneumoniae* strains isolated from Mexico City produce robust biofilms on abiotic surfaces but not on human lung cells. *Microbial Drug Resistance*, 24(4), 422-433.
- Oteo, J., Saez, D., Bautista, V., Fernández-Romero, S., Hernández-Molina, J. M., Pérez-Vázquez, M., Aracil, B., Campos, J., & Spanish Collaborating Group for the Antibiotic Resistance Surveillance Program (2013). Carbapenemase-producing enterobacteriaceae in Spain in 2012. *Antimicrobial agents and chemotherapy*, 57(12), 6344-6347.

References

- Pacheco, T., Gomes, A. É. I., Siqueira, N. M. G., Assoni, L., Darrieux, M., Venter, H., & Ferraz, L. F. C. (2021). SdiA, a Quorum-Sensing Regulator, Suppresses Fimbriae Expression, Biofilm Formation, and Quorum-Sensing Signaling Molecules Production in *Klebsiella pneumoniae*. *Frontiers in Microbiology*, *12*, 1229.
- Paczosa, M. K., & Mecsas, J. (2016). *Klebsiella pneumoniae*: going on the offense with a strong defense. *Microbiology and molecular biology reviews*, *80*(3), 629-661.
- Pajand, O., Darabi, N., Arab, M., Ghorbani, R., Bameri, Z., Ebrahimi, A., & Hojabri, Z. (2020). The emergence of the hypervirulent *Klebsiella pneumoniae* (hvKp) strains among circulating clonal complex 147 (CC147) harbouring bla NDM/OXA-48 carbapenemases in a tertiary care center of Iran. *Annals of clinical microbiology and antimicrobials*, *19*(1), 1-9.
- Palacios-Baena, Z. R., Oteo, J., Conejo, C., Larrosa, M. N., Bou, G., Fernández-Martínez, M., ... & Bartolomé, R. M. (2016). Comprehensive clinical and epidemiological assessment of colonisation and infection due to carbapenemase-producing Enterobacteriaceae in Spain. *Journal of Infection*, *72*(2), 152-160.
- Pan, Y. J., Fang, H. C., Yang, H. C., Lin, T. L., Hsieh, P. F., Tsai, F. C., ... & Wang, J. T. (2008). Capsular polysaccharide synthesis regions in *Klebsiella pneumoniae* serotype K57 and a new capsular serotype. *Journal of clinical microbiology*, *46*(7), 2231-2240.
- Pan, Y. J., Lin, T. L., Chen, C. T., Chen, Y. Y., Hsieh, P. F., Hsu, C. R., ... & Wang, J. T. (2015). Genetic analysis of capsular polysaccharide synthesis gene clusters in 79 capsular types of *Klebsiella* spp. *Scientific reports*, *5*(1), 1-10.
- Pan, Y. J., Lin, T. L., Chen, Y. H., Hsu, C. R., Hsieh, P. F., Wu, M. C., & Wang, J. T. (2013). Capsular types of *Klebsiella pneumoniae* revisited by wzc sequencing. *PLoS one*, *8*(12), e80670.
- Panjaitan, N. S. D., Horng, Y. T., Chien, C. C., Yang, H. C., You, R. I., & Soo, P. C. (2021). The PTS Components in *Klebsiella pneumoniae* Affect Bacterial Capsular Polysaccharide Production and Macrophage Phagocytosis Resistance. *Microorganisms*, *9*(2), 335.
- Papadimitriou-Olivgeris, M., Bartzavali, C., Georgakopoulou, A., Kolonitsiou, F., Papamichail, C., Spiliopoulou, I., ... & Marangos, M. (2021). Mortality of Pandrug-Resistant *Klebsiella pneumoniae* Bloodstream Infections in Critically Ill Patients: A Retrospective Cohort of 115 Episodes. *Antibiotics*, *10*(1), 76.
- Park, S., Lee, H., Shin, D., & Ko, K. S. (2020). Change of Hypermucoviscosity in the Development of Tigecycline Resistance in Hypervirulent *Klebsiella pneumoniae* Sequence Type 23 Strains. *Microorganisms*, *8*(10), 1562.
- Partridge, S. R., Kwong, S. M., Firth, N., & Jensen, S. O. (2018). Mobile genetic elements associated with antimicrobial resistance. *Clinical microbiology reviews*, *31*(4), e00088-17.
- Partridge, S. R., Zong, Z., & Iredell, J. R. (2011). Recombination in IS26 and Tn2 in the evolution of multiresistance regions carrying bla CTX-M-15 on conjugative IncF plasmids from *Escherichia coli*. *Antimicrobial agents and chemotherapy*, *55*(11), 4971-4978.
- Parveen, R. M., Harish, B. N., & Parija, S. C. (2010). Emerging carbapenem resistance among nosocomial isolates of *Klebsiella pneumoniae* in South India. *Int J Pharma Bio Sci*, *1*(2), 1-11.
- Paterson, D. L., & Bonomo, R. A. (2005). Extended-spectrum β -lactamases: a clinical update. *Clinical microbiology reviews*, *18*(4), 657-686.
- Paterson, D. L., Siu, K. L., & Chang, F. Y. (2014). *Klebsiella* species (*K. pneumoniae*, *K. oxytoca*, *K. ozaenae* and *K. rhinoscleromatis*). *Antimicrobe*, *9*, 74-76.
- Patro, L., & Rathinavelan, T. (2019). Targeting the Sugary Armor of *Klebsiella* Species. *Frontiers in cellular and infection microbiology*, *9*, 367.
- Peeters, E., Nelis, H. J., & Coenye, T. (2008). Comparison of multiple methods for quantification of microbial biofilms grown in microtiter plates. *Journal of microbiological methods*, *72*(2), 157-165.
- Peirano, G., Chen, L., Kreiswirth, B. N., & Pitout, J. D. (2020). Emerging antimicrobial-resistant high-risk *Klebsiella pneumoniae* clones ST307 and ST147. *Antimicrobial agents and chemotherapy*, *64*(10), e01148-20.
- Peirano, G., Lascos, C., Hackel, M., Hoban, D. J., & Pitout, J. D. (2014). Molecular epidemiology of Enterobacteriaceae that produce VIMs and IMPs from the SMART surveillance program. *Diagnostic microbiology and infectious disease*, *78*(3), 277-281.

- Pelling, H., Nzakizwanayo, J., Milo, S., Denham, E. L., MacFarlane, W. M., Bock, L. J., ... & Jones, B. V. (2019). Bacterial biofilm formation on indwelling urethral catheters. *Letters in applied microbiology*, 68(4), 277-293.
- Pérez-Vázquez, M., Sola Campoy, P. J., Ortega, A., Bautista, V., Monzón, S., Ruiz-Carrascoso, G., ... & Oteo-Iglesias, J. (2019). Emergence of NDM-producing *Klebsiella pneumoniae* and *Escherichia coli* in Spain: phylogeny, resistome, virulence and plasmids encoding bla NDM-like genes as determined by WGS. *Journal of Antimicrobial Chemotherapy*, 74(12), 3489-3496.
- Philippon, A., Slama, P., Dény, P., & Labia, R. (2016). A structure-based classification of class A β -lactamases, a broadly diverse family of enzymes. *Clinical Microbiology Reviews*, 29(1), 29-57.
- Piperaki, E. T., Syrogiannopoulos, G. A., Tzouvelekis, L. S., & Daikos, G. L. (2017). *Klebsiella pneumoniae*: Virulence, Biofilm and Antimicrobial Resistance. *The Pediatric infectious disease journal*, 36(10), 1002–1005.
- Pitout, J. D., Nordmann, P., & Poirel, L. (2015). Carbapenemase-producing *Klebsiella pneumoniae*, a key pathogen set for global nosocomial dominance. *Antimicrobial agents and chemotherapy*, 59(10), 5873-5884.
- Pitout, J. D., Peirano, G., Kock, M. M., Strydom, K. A., & Matsumura, Y. (2019). The global ascendancy of OXA-48-type carbapenemases. *Clinical microbiology reviews*, 33(1), e00102-19.
- Podschun, R., & Ullmann, U. (1992). Isolation of *Klebsiella terrigena* from clinical specimens. *European Journal of Clinical Microbiology and Infectious Diseases*, 11(4), 349-352.
- Podschun, R., & Ullmann, U. (1998). *Klebsiella* spp. as nosocomial pathogens: epidemiology, taxonomy, typing methods, and pathogenicity factors. *Clinical microbiology reviews*, 11(4), 589-603.
- Podschun, R., Sievers, D., Fischer, A., & Ullmann, U. (1993). Serotypes, hemagglutinins, siderophore synthesis, and serum resistance of *Klebsiella* isolates causing human urinary tract infections. *Journal of infectious diseases*, 168(6), 1415-1421.
- Poirel, L., Bonnin, R. A., & Nordmann, P. (2012). Genetic features of the widespread plasmid coding for the carbapenemase OXA-48. *Antimicrobial agents and chemotherapy*, 56(1), 559-562.
- Poirel, L., Jayol, A., & Nordmann, P. (2017). Polymyxins: antibacterial activity, susceptibility testing, and resistance mechanisms encoded by plasmids or chromosomes. *Clinical microbiology reviews*, 30(2), 557-596.
- Poirel, L., Jayol, A., Bontron, S., Villegas, M. V., Ozdamar, M., Türkoglu, S., & Nordmann, P. (2015). The mgrB gene as a key target for acquired resistance to colistin in *Klebsiella pneumoniae*. *Journal of Antimicrobial Chemotherapy*, 70(1), 75-80.
- Poirel, L., Potron, A., & Nordmann, P. (2012). OXA-48-like carbapenemases: the phantom menace. *Journal of Antimicrobial Chemotherapy*, 67(7), 1597-1606.
- Poirel, L., Walsh, T. R., Cuvillier, V., & Nordmann, P. (2011). Multiplex PCR for detection of acquired carbapenemase genes. *Diagnostic microbiology and infectious disease*, 70(1), 119-123.
- Pomakova, D. K., Hsiao, C. B., Beanan, J. M., Olson, R., MacDonald, U., Keynan, Y., & Russo, T. A. (2012). Clinical and phenotypic differences between classic and hypervirulent *Klebsiella pneumoniae*: an emerging and under-recognized pathogenic variant. *European journal of clinical microbiology & infectious diseases*, 31(6), 981-989.
- Potron, A., Nordmann, P., & Poirel, L. (2013). Characterization of OXA-204, a carbapenem-hydrolyzing class D β -lactamase from *Klebsiella pneumoniae*. *Antimicrobial agents and chemotherapy*, 57(1), 633-636.
- Potron, A., Rondinaud, E., Poirel, L., Belmonte, O., Boyer, S., Camiade, S., & Nordmann, P. (2013). Genetic and biochemical characterisation of OXA-232, a carbapenem-hydrolysing class D β -lactamase from Enterobacteriaceae. *International journal of antimicrobial agents*, 41(4), 325-329.
- Pragasam, A. K., Shankar, C., Veeraraghavan, B., Biswas, I., Nabarro, L. E., Inbanathan, F. Y., ... & Verghese, S. (2017). Molecular mechanisms of colistin resistance in *Klebsiella pneumoniae* causing bacteremia from India—a first report. *Frontiers in microbiology*, 7, 2135.
- Pruzzo, C., Guzman, C. A., Calegari, L., & Satta, G. (1989). Impairment of phagocytosis by the *Klebsiella pneumoniae* mannose-inhibitable adhesin-T7 receptor. *Infection and immunity*, 57(3), 975-982.
- Qu, T. T., Zhou, J. C., Jiang, Y., Shi, K. R., Li, B., Shen, P., ... & Yu, Y. S. (2015). Clinical and microbiological characteristics of *Klebsiella pneumoniae* liver abscess in East China. *BMC infectious diseases*, 15(1), 1-8.

References

- Rahn, A., Drummelsmith, J., & Whitfield, C. (1999). Conserved organization in the *cps* gene clusters for expression of *Escherichia coli* group 1 K antigens: relationship to the colanic acid biosynthesis locus and the *cps* genes from *Klebsiella pneumoniae*. *Journal of bacteriology*, *181*(7), 2307-2313.
- Ramirez, M. S., Traglia, G. M., Lin, D. L., Tran, T., & Tolmashy, M. E. (2014). Plasmid-mediated antibiotic resistance and virulence in gram-negatives: the *Klebsiella pneumoniae* paradigm. *Microbiology spectrum*, *2*(5), 2-5.
- Ramos, J. N., Valadão, T. B., Baio, P., Mattos-Guaraldi, A. L., & Vieira, V. V. (2020). Novel mutations in the QRDR region *gyrA* gene in multidrug-resistance *Corynebacterium* spp. isolates from intravenous sites. *Antonie van Leeuwenhoek*, *113*(4), 589–592
- Ravinder, M., Liao, K. S., Cheng, Y. Y., Pawar, S., Lin, T. L., Wang, J. T., & Wu, C. Y. (2020). A Synthetic Carbohydrate-Protein Conjugate Vaccine Candidate against *Klebsiella pneumoniae* Serotype K2. *The Journal of Organic Chemistry*, *85*(24), 15964-15997.
- Raza, A., Ngieng, S. C., Sime, F. B., Cabot, P. J., Roberts, J. A., Popat, A., ... & Falconer, J. R. (2020). Oral meropenem for superbugs: challenges and opportunities. *Drug Discovery Today*.
- Remya, P. A., Shanthi, M., & Sekar, U. (2019). Characterisation of virulence genes associated with pathogenicity in *Klebsiella pneumoniae*. *Indian journal of medical microbiology*, *37*(2), 210–218.
- Remya, P., Shanthi, M., & Sekar, U. (2018). Occurrence and characterization of hyperviscous K1 and K2 serotype in *Klebsiella pneumoniae*. *Journal of laboratory physicians*, *10*(03), 283-288.
- Renelli, M. (2003). *DNA-containing membrane vesicles of Pseudomonas aeruginosa PAO1 and their genetic transformation potential* (Doctoral dissertation).
- Revdiwala, S., Rajdev, B. M., & Mulla, S. (2012). Characterization of bacterial etiologic agents of biofilm formation in medical devices in critical care setup. *Critical care research and practice*, *2012*.
- Rezaee, M. A., Langarizadeh, N., & Aghazadeh, M. (2012). First report of class 1 and class 2 integrons in multidrug-resistant *Klebsiella pneumoniae* isolates from northwest Iran. *Japanese journal of infectious diseases*, *65*(3), 256-259.
- Roberts, M. C., Swenson, C. D., Owens, L. M., & Smith, A. L. (1980). Characterization of chloramphenicol-resistant *Haemophilus influenzae*. *Antimicrobial Agents and Chemotherapy*, *18*(4), 610-615.
- Rodrigues, C., Bavlovič, J., Machado, E., Amorim, J., Peixe, L., & Novais, Â. (2016). KPC-3-producing *Klebsiella pneumoniae* in Portugal linked to previously circulating non-CG258 lineages and uncommon genetic platforms (Tn4401d-IncFIA and Tn4401d-IncN). *Frontiers in microbiology*, *7*, 1000.
- Rodrigues, C., Desai, S., Passet, V., Gajjar, D., & Brisse, S. (2021). Genomic evolution of the globally disseminated multidrug-resistant *Klebsiella pneumoniae* clonal group 147. *bioRxiv*.
- Rodrigues, C., Machado, E., Ramos, H., Peixe, L., & Novais, Â. (2014). Expansion of ESBL-producing *Klebsiella pneumoniae* in hospitalized patients: a successful story of international clones (ST15, ST147, ST336) and epidemic plasmids (IncR, IncFIIK). *International Journal of Medical Microbiology*, *304*(8), 1100-1108.
- Rodrigues, C., Machado, E., Ramos, H., Peixe, L., & Novais, Â. (2014). Expansion of ESBL-producing *Klebsiella pneumoniae* in hospitalized patients: a successful story of international clones (ST15, ST147, ST336) and epidemic plasmids (IncR, IncFIIK). *International Journal of Medical Microbiology*, *304*(8), 1100-1108.
- Rodrigues, C., Passet, V., Rakotondrasoa, A., & Brisse, S. (2018). Identification of *Klebsiella pneumoniae*, *Klebsiella quasipneumoniae*, *Klebsiella variicola* and Related Phylogroups by MALDI-TOF Mass Spectrometry. *Frontiers in microbiology*, *9*, 3000.
- Rojas, L. J., Hujer, A. M., Rudin, S. D., Wright, M. S., Domitrovic, T. N., Marshall, S. H., ... & Adams, M. D. (2017). NDM-5 and OXA-181 beta-lactamases, a significant threat continues to spread in the Americas. *Antimicrobial agents and chemotherapy*, *61*(7).
- Rojas, L. J., Mojica, M. F., Blanco, V. M., Correa, A., Montealegre, M. C., De La Cadena, E., ... & Villegas, M. V. (2013). Emergence of *Klebsiella pneumoniae* cohabiting KPC and VIM carbapenemases in Colombia. *Antimicrobial agents and chemotherapy*, *57*(2), 1101-1102.
- Rosenblueth, M., Martínez, L., Silva, J., & Martínez-Romero, E. (2004). *Klebsiella variicola*, a novel species with clinical and plant-associated isolates. *Systematic and applied microbiology*, *27*(1), 27-35.
- Runcharoen, C., Moradigaravand, D., Blane, B., Paksanont, S., Thammachote, J., Anun, S., ... & Peacock, S. J. (2017). Whole genome sequencing reveals high-resolution epidemiological links between clinical and environmental *Klebsiella pneumoniae*. *Genome medicine*, *9*(1), 1-10.

- Russo, T. A., & Marr, C. M. (2019). Hypervirulent *Klebsiella pneumoniae*. *Clinical microbiology reviews*, 32(3), e00001-19.
- Russo, T. A., Olson, R., Fang, C. T., Stoesser, N., Miller, M., MacDonald, U., ... & Johnson, J. R. (2018). Identification of biomarkers for differentiation of hypervirulent *Klebsiella pneumoniae* from classical *K. pneumoniae*. *Journal of clinical microbiology*, 56(9), e00776-18.
- Russo, T. A., Olson, R., MacDonald, U., Beanan, J., & Davidson, B. A. (2015). Aerobactin, but not yersiniabactin, salmochelin, or enterobactin, enables the growth/survival of hypervirulent (hypermucoviscous) *Klebsiella pneumoniae* ex vivo and in vivo. *Infection and immunity*, 83(8), 3325-3333.
- Sakamoto, N., Akeda, Y., Sugawara, Y., Takeuchi, D., Motooka, D., Yamamoto, N., Laolerd, W., Santanirand, P., & Hamada, S. (2018). Genomic Characterization of Carbapenemase-Producing *Klebsiella pneumoniae* with Chromosomally Carried bla_{NDM-1}. *Antimicrobial agents and chemotherapy*, 62(12), e01520-18.
- Salgado-Pabón, W., Du, Y., Hackett, K. T., Lyons, K. M., Arvidson, C. G., & Dillard, J. P. (2010). Increased expression of the type IV secretion system in piliated *Neisseria gonorrhoeae* variants. *Journal of bacteriology*, 192(7), 1912-1920.
- Sambrook, J., Fritsch, E. F., & Maniatis, T. (1989). *Molecular cloning: a laboratory manual* (No. Ed. 2). Cold spring harbor laboratory press.
- Sambrook, J., Russell, D.W., (2001). *Molecular Cloning. A Laboratory Manual* 1982. Cold Spring Harbor Laboratory Press, Cold Spring Harbor.
- Sampei, G. I., Furuya, N., Tachibana, K., Saitou, Y., Suzuki, T., Mizobuchi, K., & Komano, T. (2010). Complete genome sequence of the incompatibility group I1 plasmid R64. *Plasmid*, 64(2), 92-103.
- Santiago, A. J., Burgos-Garay, M. L., Kartforosh, L., Mazher, M., & Donlan, R. M. (2020). Bacteriophage treatment of carbapenemase-producing *Klebsiella pneumoniae* in a multispecies biofilm: a potential biocontrol strategy for healthcare facilities. *AIMS microbiology*, 6(1), 43.
- Schmid, J., Sieber, V., & Rehm, B. (2015). Bacterial exopolysaccharides: biosynthesis pathways and engineering strategies. *Frontiers in microbiology*, 6, 496.
- Schmittgen, T. D., & Livak, K. J. (2008). Analyzing real-time PCR data by the comparative CT method. *Nature protocols*, 3(6), 1101-1108.
- Schroll, C., Barken, K. B., Krogfelt, K. A., & Struve, C. (2010). Role of type 1 and type 3 fimbriae in *Klebsiella pneumoniae* biofilm formation. *BMC microbiology*, 10(1), 1-10.
- Seiffert, S. N., Marschall, J., Perreten, V., Carattoli, A., Furrer, H., & Endimiani, A. (2014). Emergence of *Klebsiella pneumoniae* co-producing NDM-1, OXA-48, CTX-M-15, CMY-16, QnrA and ArmA in Switzerland. *International journal of antimicrobial agents*, 44(3), 260-262.
- Shadkam, S., Goli, H. R., Mirzaei, B., Gholami, M., & Ahanjan, M. (2021). Correlation between antimicrobial resistance and biofilm formation capability among *Klebsiella pneumoniae* strains isolated from hospitalized patients in Iran. *Annals of Clinical Microbiology and Antimicrobials*, 20(1), 1-7.
- Shahid, M., Malik, A., Akram, M., Agrawal, L. M., Khan, A. U., & Agrawal, M. (2008). Prevalent phenotypes and antibiotic resistance in *Escherichia coli* and *Klebsiella pneumoniae* at an Indian tertiary care hospital: plasmid-mediated cefoxitin resistance. *International journal of infectious diseases*, 12(3), 256-264.
- Shankar, C., Jacob, J. J., Sugumar, S. G., Natarajan, L., Rodrigues, C., Mathur, P., ... & Veeraraghavan, B. (2021). Distinctive Mobile Genetic Elements Observed in the Clonal Expansion of Carbapenem-Resistant *Klebsiella pneumoniae* in India. *Microbial Drug Resistance*.
- Shankar, C., Kumar, S., Venkatesan, M., & Veeraraghavan, B. (2019). Emergence of ST147 *Klebsiella pneumoniae* carrying bla_{NDM-7} on IncA/C2 with ompK35 and ompK36 mutations in India. *Journal of infection and public health*, 12(5), 741-743.
- Shankar, C., Mathur, P., Venkatesan, M., Pragasam, A. K., Anandan, S., Khurana, S., & Veeraraghavan, B. (2019). Rapidly disseminating bla_{OXA-232} carrying *Klebsiella pneumoniae* belonging to ST231 in India: multiple and varied mobile genetic elements. *BMC microbiology*, 19(1), 137.
- Shankar, C., Venkatesan, M., Rajan, R., Mani, D., Lal, B., Prakash, J. A. J., ... & Veeraraghavan, B. (2019). Molecular characterization of colistin-resistant *Klebsiella pneumoniae* & its clonal relationship among Indian isolates. *The Indian journal of medical research*, 149(2), 199.
- Shen, J., Lv, L., Wang, X., Xiu, Z., & Chen, G. (2017). Comparative analysis of CRISPR-Cas systems in *Klebsiella* genomes. *Journal of basic microbiology*, 57(4), 325-336.

References

- Sheppard, A. E., Stoesser, N., Wilson, D. J., Sebra, R., Kasarskis, A., Anson, L. W., ... & Mathers, A. J. (2016). Nested Russian doll-like genetic mobility drives rapid dissemination of the carbapenem resistance gene bla KPC. *Antimicrobial agents and chemotherapy*, 60(6), 3767-3778.
- Sherif, M., Palmieri, M., Mirande, C., El-Mahallawy, H., Rashed, H. G., Abd-El-Reheem, F., ... & El-Kholy, A. (2021). Whole-genome sequencing of Egyptian multidrug-resistant *Klebsiella pneumoniae* isolates: a multi-center pilot study. *European Journal of Clinical Microbiology & Infectious Diseases*, 1-10.
- Shi, W., Li, K., Ji, Y., Jiang, Q., Wang, Y., Shi, M., & Mi, Z. (2013). Carbapenem and cefoxitin resistance of *Klebsiella pneumoniae* strains associated with porin OmpK36 loss and DHA-1 β -lactamase production. *Brazilian Journal of Microbiology*, 44(2), 435-442.
- Shi, Y., Peng, Y., Zhang, Y., Chen, Y., Zhang, C., Luo, X., ... & Gong, Y. (2021). Safety and Efficacy of a Phage, kpsk3, in an in vivo Model of Carbapenem-Resistant Hypermucoviscous *Klebsiella pneumoniae* Bacteremia. *Frontiers in microbiology*, 12.
- Shmaefsky, B. R. (1990). Artificial urine for laboratory testing. *The American Biology Teacher*, 52(3), 170-172.
- Shon, A. S., & Russo, T. A. (2012). Hypervirulent *Klebsiella pneumoniae*: the next superbug?. *Future microbiology*, 7(6), 669-671.
- Shon, A. S., Bajwa, R. P., & Russo, T. A. (2013). Hypervirulent (hypermucoviscous) *Klebsiella pneumoniae*: a new and dangerous breed. *Virulence*, 4(2), 107-118.
- Shu, H. Y., Fung, C. P., Liu, Y. M., Wu, K. M., Chen, Y. T., Li, L. H., ... & Tsai, S. F. (2009). Genetic diversity of capsular polysaccharide biosynthesis in *Klebsiella pneumoniae* clinical isolates. *Microbiology*, 155(12), 4170-4183.
- Simner, P. J., Antar, A. A., Hao, S., Gurtowski, J., Tamma, P. D., Rock, C., ... & Timp, W. (2018). Antibiotic pressure on the acquisition and loss of antibiotic resistance genes in *Klebsiella pneumoniae*. *Journal of Antimicrobial Chemotherapy*, 73(7), 1796-1803.
- Singla, S., Harjai, K., & Chhibber, S. (2014). Artificial *Klebsiella pneumoniae* biofilm model mimicking in vivo system: altered morphological characteristics and antibiotic resistance. *The Journal of antibiotics*, 67(4), 305-309.
- Snyman, Y., Whitelaw, A. C., Reuter, S., Maloba, M. R. B., & Newton-Foot, M. (2021). Colistin resistance mechanisms in clinical *Escherichia coli* and *Klebsiella* spp. isolates from the Western Cape of South Africa. *Microbial Drug Resistance*.
- Song, F., Zhang, K., Huang, J., Qian, Z., Zhou, H., Cai, J., ... & Zhang, G. (2021). Clinical Characteristics, Risk Factors, and Outcomes of Patients with Polymicrobial *Klebsiella pneumoniae* Bloodstream Infections. *BioMed Research International*, 2021.
- Sonnevend, Á., Ghazawi, A. A., Hashmey, R., Jamal, W., Rotimi, V. O., Shibl, A. M., ... & Pál, T. (2015). Characterization of carbapenem-resistant Enterobacteriaceae with high rate of autochthonous transmission in the Arabian Peninsula. *PloS one*, 10(6), e0131372.
- Sonnevend, Á., Ghazawi, A., Hashmey, R., Haidermota, A., Girgis, S., Alfaresi, M., ... & Pál, T. (2017). Multihospital occurrence of pan-resistant *Klebsiella pneumoniae* sequence type 147 with an ISEcp1-directed blaOXA-181 insertion in the mgrB gene in the United Arab Emirates. *Antimicrobial agents and chemotherapy*, 61(7).
- Stahlhut, S. G., Struve, C., Krogfelt, K. A., & Reisner, A. (2012). Biofilm formation of *Klebsiella pneumoniae* on urethral catheters requires either type 1 or type 3 fimbriae. *FEMS Immunology & Medical Microbiology*, 65(2), 350-359.
- Stepanović, S., Ćirković, I., Ranin, L., & S vabić-Vlahović, M. (2004). Biofilm formation by *Salmonella* spp. and *Listeria monocytogenes* on plastic surface. *Letters in applied microbiology*, 38(5), 428-432.
- Stickler, D. J. (2008). Bacterial biofilms in patients with indwelling urinary catheters. *Nature clinical practice urology*, 5(11), 598-608.
- Stoesser, N., Giess, A., Batty, E. M., Sheppard, A. E., Walker, A. S., Wilson, D. J., ... & Joshi, S. (2014). Genome sequencing of an extended series of NDM-producing *Klebsiella pneumoniae* isolates from neonatal infections in a Nepali hospital characterizes the extent of community-versus hospital-associated transmission in an endemic setting. *Antimicrobial agents and chemotherapy*, 58(12), 7347-7357.
- Struve, C., Bojer, M., & Krogfelt, K. A. (2008). Characterization of *Klebsiella pneumoniae* type 1 fimbriae by detection of phase variation during colonization and infection and impact on virulence. *Infection and immunity*, 76(9), 4055-4065.

- Sullivan, M. J., Petty, N. K., & Beatson, S. A. (2011). Easyfig: a genome comparison visualizer. *Bioinformatics*, 27(7), 1009-1010.
- Sun, F., Wu, D., Qiu, Z., Jin, M., & Li, J. (2010). Development of real-time PCR systems based on SYBR Green for the specific detection and quantification of *Klebsiella pneumoniae* in infant formula. *Food Control*, 21(4), 487-491.
- Sundström, L., Rådström, P., Swedberg, G., & Sköld, O. (1988). Site-specific recombination promotes linkage between trimethoprim-and sulfonamide resistance genes. Sequence characterization of *dhfrV* and *sull* and a recombination active locus of Tn 21. *Molecular and General Genetics MGG*, 213(2), 191-201.
- Surgers, L., Boyd, A., Girard, P. M., Arlet, G., & Decré, D. (2016). ESBL-producing strain of hypervirulent *Klebsiella pneumoniae* K2, France. *Emerging infectious diseases*, 22(9), 1687.
- Szilágyi, E., Füzi, M., Damjanova, I., Böröcz, K., Szonyi, K., Tóth, A., & Nagy, K. (2010). Investigation of extended-spectrum beta-lactamase-producing *Klebsiella pneumoniae* outbreaks in Hungary between 2005 and 2008. *Acta microbiologica et immunologica Hungarica*, 57(1), 43-53.
- Tai, C. H., Hsu, C. N., Yang, S. C., Wu, C. K., Liang, C. M., Tai, W. C., ... & Lee, C. H. (2020). The impact of aspirin on *Klebsiella pneumoniae* liver abscess in diabetic patients. *Scientific reports*, 10(1), 1-10.
- Tan, T. Y., Ong, M., Cheng, Y., & Ng, L. S. Y. (2019). Hypermucoviscosity, *rmpA*, and aerobactin are associated with community-acquired *Klebsiella pneumoniae* bacteremic isolates causing liver abscess in Singapore. *Journal of Microbiology, Immunology and Infection*, 52(1), 30-34.
- Taylor, C. M., & Roberts, I. S. (2005). Capsular polysaccharides and their role in virulence. *Contributions to microbiology*, 12, 55-66.
- Tetz, G. V., Artemenko, N. K., & Tetz, V. V. (2009). Effect of DNase and antibiotics on biofilm characteristics. *Antimicrobial agents and chemotherapy*, 53(3), 1204-1209.
- The European Committee on Antimicrobial Susceptibility Testing (EUCAST) and Clinical and Laboratory Standards Institute (CLSI). Recommendations for MIC determination of colistin (polymyxin E) as recommended by the joint CLSI-EUCAST Polymyxin Breakpoints Working Group. (2016). http://www.eucast.org/guidance_documents/
- The European Committee on Antimicrobial Susceptibility Testing. Media preparation for EUCAST disk diffusion testing and for determination of MIC values by the broth microdilution method. v 8.0, 2018. Available at: <http://www.eucast.org> (last accessed November 2018)
- Thomas, C. M. (2000). *Horizontal gene pool: bacterial plasmids and gene spread*. CRC Press.
- Tipton, K. A., Dimitrova, D., & Rather, P. N. (2015). Phase-variable control of multiple phenotypes in *Acinetobacter baumannii* strain AB5075. *Journal of bacteriology*, 197(15), 2593-2599.
- Tofteland, S., Naseer, U., Lislevand, J. H., Sundsfjord, A., & Samuelsen, Ø. (2013). A long-term low-frequency hospital outbreak of KPC-producing *Klebsiella pneumoniae* involving intergenus plasmid diffusion and a persisting environmental reservoir. *PLoS One*, 8(3), e59015.
- Togawa, A., Toh, H., Onozawa, K., Yoshimura, M., Tokushige, C., Shimono, N., ... & Tamura, K. (2015). Influence of the bacterial phenotypes on the clinical manifestations in *Klebsiella pneumoniae* bacteremia patients: a retrospective cohort study. *Journal of Infection and Chemotherapy*, 21(7), 531-537.
- Tsala, M., Vourli, S., Georgiou, P. C., Pournaras, S., Tsakris, A., Daikos, G. L., ... & Meletiadis, J. (2018). Exploring colistin pharmacodynamics against *Klebsiella pneumoniae*: a need to revise current susceptibility breakpoints. *Journal of Antimicrobial Chemotherapy*, 73(4), 953-961.
- Turton, J. F., Baklan, H., Siu, L. K., Kaufmann, M. E., & Pitt, T. L. (2008). Evaluation of a multiplex PCR for detection of serotypes K1, K2 and K5 in *Klebsiella* sp. and comparison of isolates within these serotypes. *FEMS microbiology letters*, 284(2), 247-252.
- Turton, J. F., Payne, Z., Coward, A., Hopkins, K. L., Turton, J. A., Doumith, M., & Woodford, N. (2018). Virulence genes in isolates of *Klebsiella pneumoniae* from the UK during 2016, including among carbapenemase gene-positive hypervirulent K1-ST23 and 'non-hypervirulent' types ST147, ST15 and ST383. *Journal of medical microbiology*, 67(1), 118-128.
- Ushie, S. N., Oyediji, K. S., Ogban, G. I., Ushie, D. E., Nwaokorie, F. O., Odeniyi, O. M., ... & Ezeador, C. O. (2020). Molecular epidemiology of extended spectrum β lactamases producing *Escherichia coli* and *Klebsiella* species in catheterized patients. *European journal of Medical and Health Sciences*, 2(4).
- Vasudevan, R. (2014). Biofilms: microbial cities of scientific significance. *J Microbiol Exp*, 1(3), 00014.

References

- Veeraraghavan B, Shankar C, Karunasree S, Kumari S, Ravi R, Ralph R. (2017). Carbapenem resistant *Klebsiella pneumoniae* isolated from bloodstream infection: Indian experience. *Pathogens Global Health*, 111(5):240–6.
- Verma, A., Bhani, D., Tomar, V., Bachhiwal, R., & Yadav, S. (2016). Differences in bacterial colonization and biofilm formation property of uropathogens between the two most commonly used indwelling urinary catheters. *Journal of clinical and diagnostic research: JCDR*, 10(6), PC01.
- Vernet, V., Philippon, A., Madoulet, C., Vistelle, R., Jaussaud, R., & Chippaux, C. (1995). Virulence factors (aerobactin and mucoid phenotype) in *Klebsiella pneumoniae* and *Escherichia coli* blood culture isolates. *FEMS microbiology letters*, 130(1), 51-57.
- Victor, L. Y., Hansen, D. S., Ko, W. C., Sagnimeni, A., Klugman, K. P., Von Gottberg, A., ... & International *Klebsiella* Study Group. (2007). Virulence characteristics of *Klebsiella* and clinical manifestations of *K. pneumoniae* bloodstream infections. *Emerging infectious diseases*, 13(7), 986.
- Vielva, L., de Toro, M., Lanza, V. F., & de la Cruz, F. (2017). PLACNETw: a web-based tool for plasmid reconstruction from bacterial genomes. *Bioinformatics*, 33(23), 3796-3798.
- Vila, A., Cassata, A., Pagella, H., Amadio, C., Yeh, K. M., Chang, F. Y., & Siu, L. K. (2011). Appearance of *Klebsiella pneumoniae* liver abscess syndrome in Argentina: case report and review of molecular mechanisms of pathogenesis. *The open microbiology journal*, 5, 107.
- Villa, L., Feudi, C., Fortini, D., García-Fernández, A., & Carattoli, A. (2014). Genomics of KPC producing *Klebsiella pneumoniae* sequence type 512 clone highlights the role of RamR and ribosomal S10 protein mutations in conferring tigecycline resistance. *Antimicrobial agents and chemotherapy*, 58(3), 1707-1712.
- Villa, L., Poirel, L., Nordmann, P., Carta, C., & Carattoli, A. (2012). Complete sequencing of an IncH plasmid carrying the bla NDM-1, bla CTX-M-15 and qnrB1 genes. *Journal of antimicrobial chemotherapy*, 67(7), 1645-1650.
- Vuotto, C., Longo, F., Pascolini, C., Donelli, G., Balice, M. P., Libori, M. F., Tiracchia, V., Salvia, A., & Varaldo, P. E. (2017). Biofilm formation and antibiotic resistance in *Klebsiella pneumoniae* urinary strains. *Journal of applied microbiology*, 123(4), 1003–1018.
- Walker, K. A., Miner, T. A., Palacios, M., Trzilova, D., Frederick, D. R., Broberg, C. A., ... & Miller, V. L. (2019). A *Klebsiella pneumoniae* regulatory mutant has reduced capsule expression but retains hypermucoviscosity. *MBio*, 10(2), e00089-19.
- Walker, K. A., Treat, L. P., Sepúlveda, V. E., & Miller, V. L. (2020). The small protein RmpD drives hypermucoviscosity in *Klebsiella pneumoniae*. *MBio*, 11(5), e01750-20.
- Wang, B. B., Quan, Y. H., Xu, Z. M., & Zhao, Q. (2020). Preparation of highly effective antibacterial coating with polydopamine/chitosan/silver nanoparticles via simple immersion. *Progress in Organic Coatings*, 149, 105967.
- Wang, G., Zhao, G., Chao, X., Xie, L., & Wang, H. (2020). The characteristic of virulence, biofilm and antibiotic resistance of *Klebsiella pneumoniae*. *International Journal of Environmental Research and Public Health*, 17(17), 6278.
- Wang, G., Zhao, G., Chao, X., Xie, L., & Wang, H. (2020). The Characteristic of Virulence, Biofilm and Antibiotic Resistance of *Klebsiella pneumoniae*. *International journal of environmental research and public health*, 17(17), 6278.
- Wang, H., Yan, Y., Rong, D., Wang, J., Wang, H., Liu, Z., ... & Han, Y. (2016). Increased biofilm formation ability in *Klebsiella pneumoniae* after short-term exposure to a simulated microgravity environment. *MicrobiologyOpen*, 5(5), 793-801.
- Wang, T. C., Lin, J. C., Chang, J. C., Hiaso, Y. W., Wang, C. H., Chiu, S. K., ... & Siu, L. K. (2021). Virulence among different types of hypervirulent *Klebsiella pneumoniae* with multi-locus sequence type (MLST)-11, Serotype K1 or K2 strains. *Gut Pathogens*, 13(1), 1-10.
- Wang, X., Li, H., Zhao, C., Chen, H., Liu, J., Wang, Z., ... & Wang, H. (2014). Novel NDM-9 metallo- β -lactamase identified from a ST107 *Klebsiella pneumoniae* strain isolated in China. *International journal of antimicrobial agents*, 44(1), 90-91.
- Wang, X., Xu, X., Li, Z., Chen, H., Wang, Q., Yang, P., ... & Wang, H. (2014). An outbreak of a nosocomial NDM-1-producing *Klebsiella pneumoniae* ST147 at a teaching hospital in mainland China. *Microbial Drug Resistance*, 20(2), 144-149.

- Webb, J. S., Thompson, L. S., James, S., Charlton, T., Tolker-Nielsen, T., Koch, B., ... & Kjelleberg, S. (2003). Cell death in *Pseudomonas aeruginosa* biofilm development. *Journal of bacteriology*, *185*(15), 4585-4592.
- Wesevich, A., Sutton, G., Fouts, D., Fowler, V. G., & Thaden, J. (2019, October). 221. Newly-Named *Klebsiella aerogenes* Is Associated with Poor Clinical Outcomes Relative to *Enterobacter cloacae* Complex in Patients with Bloodstream Infection. In *Open Forum Infectious Diseases* (Vol. 6).
- Westbrook, G. L., O'Hara, C. M., Roman, S. B., & Miller, J. M. (2000). Incidence and identification of *Klebsiella planticola* in clinical isolates with emphasis on newborns. *Journal of Clinical Microbiology*, *38*(4), 1495-1497.
- Whitchurch, C. B., Tolker-Nielsen, T., Ragas, P. C., & Mattick, J. S. (2002). Extracellular DNA required for bacterial biofilm formation. *Science*, *295*(5559), 1487-1487.
- White, P. A., McIver, C. J., & Rawlinson, W. D. (2001). Integrons and gene cassettes in the Enterobacteriaceae. *Antimicrobial agents and chemotherapy*, *45*(9), 2658-2661.
- Whitfield, C. (2006). Biosynthesis and assembly of capsular polysaccharides in *Escherichia coli*. *Annu. Rev. Biochem.*, *75*, 39-68.
- Whitfield, C., Wear, S. S., & Sande, C. (2020). Assembly of bacterial capsular polysaccharides and exopolysaccharides. *Annual Review of Microbiology*, *74*, 521-543.
- Wick, R. R., Judd, L. M., Gorrie, C. L., & Holt, K. E. (2017). Unicycler: resolving bacterial genome assemblies from short and long sequencing reads. *PLoS computational biology*, *13*(6), e1005595.
- Wong, J. L., Romano, M., Kerry, L. E., Kwong, H. S., Low, W. W., Brett, S. J., ... & Frankel, G. (2019). OmpK36-mediated carbapenem resistance attenuates ST258 *Klebsiella pneumoniae* in vivo. *Nature communications*, *10*(1), 1-10.
- Woodford, N., & Ellington, M. J. (2007). The emergence of antibiotic resistance by mutation. *Clinical Microbiology and Infection*, *13*(1), 5-18.
- Woodford, N., Turton, J. F., & Livermore, D. M. (2011). Multiresistant Gram-negative bacteria: the role of high-risk clones in the dissemination of antibiotic resistance. *FEMS microbiology reviews*, *35*(5), 736-755.
- World Health Organization. (2014). *Antimicrobial resistance: global report on surveillance*. World Health Organization.
- World Health Organisation.int Geneva (2017). Retrieved from: <https://www.who.int/news-room/detail/27-02-2017-who-publishes-list-of-bacteria-for-which-new-antibiotics-are-urgently-needed> (last accessed on July 2019)
- Wu, J., & Xi, C. (2009). Evaluation of different methods for extracting extracellular DNA from the biofilm matrix. *Applied and environmental microbiology*, *75*(16), 5390.
- Wyres, K. L., & Holt, K. E. (2018). *Klebsiella pneumoniae* as a key trafficker of drug resistance genes from environmental to clinically important bacteria. *Current opinion in microbiology*, *45*, 131-139.
- Wyres, K. L., Lam, M. M., & Holt, K. E. (2020). Population genomics of *Klebsiella pneumoniae*. *Nature Reviews Microbiology*, 1-16.
- Wyres, K. L., Nguyen, T. N., Lam, M. M., Judd, L. M., van Vinh Chau, N., Dance, D. A., ... & Holt, K. E. (2020). Genomic surveillance for hypervirulence and multi-drug resistance in invasive *Klebsiella pneumoniae* from South and Southeast Asia. *Genome medicine*, *12*(1), 1-16.
- Wyres, K. L., Wick, R. R., Gorrie, C., Jenney, A., Follador, R., Thomson, N. R., & Holt, K. E. (2016). Identification of *Klebsiella* capsule synthesis loci from whole genome data. *Microbial genomics*, *2*(12).
- Wyres, K. L., Wick, R. R., Judd, L. M., Froumine, R., Tokolyi, A., Gorrie, C. L., ... & Holt, K. E. (2019). Distinct evolutionary dynamics of horizontal gene transfer in drug resistant and virulent clones of *Klebsiella pneumoniae*. *PLoS genetics*, *15*(4), e1008114.
- Xu, L., Wang, M., Yuan, J., Wang, H., Li, M., Zhang, F., ... & Li, B. (2021). The KbvR Regulator Contributes to Capsule Production, Outer Membrane Protein Biosynthesis, Antiphagocytosis, and Virulence in *Klebsiella pneumoniae*. *Infection and Immunity*, *89*(5), e00016-21.
- Yamane, K., Doi, Y., Yokoyama, K., Yagi, T., Kurokawa, H., Shibata, N., ... & Arakawa, Y. (2004). Genetic environments of the *rmtA* gene in *Pseudomonas aeruginosa* clinical isolates. *Antimicrobial agents and chemotherapy*, *48*(6), 2069-2074.
- Yang, F., Deng, B., Liao, W., Wang, P., Chen, P., & Wei, J. (2019). High rate of multiresistant *Klebsiella pneumoniae* from human and animal origin. *Infection and drug resistance*, *12*, 2729.

References

- Yang, X., Dong, N., Chan, E. W. C., Zhang, R., & Chen, S. (2021). Carbapenem resistance-encoding and virulence-encoding conjugative plasmids in *Klebsiella pneumoniae*. *Trends in Microbiology*, 29(1), 65-83.
- Yeh, K. M., Kurup, A., Siu, L. K., Koh, Y. L., Fung, C. P., Lin, J. C., ... & Koh, T. H. (2007). Capsular serotype K1 or K2, rather than magA and rmpA, is a major virulence determinant for *Klebsiella pneumoniae* liver abscess in Singapore and Taiwan. *Journal of clinical microbiology*, 45(2), 466-471.
- Yeh, K. M., Lin, J. C., Yin, F. Y., Fung, C. P., Hung, H. C., Siu, L. K., & Chang, F. Y. (2010). Revisiting the importance of virulence determinant magA and its surrounding genes in *Klebsiella pneumoniae* causing pyogenic liver abscesses: exact role in serotype K1 capsule formation. *The Journal of infectious diseases*, 201(8), 1259-1267.
- Yigit, H., Queenan, A. M., Anderson, G. J., Domenech-Sanchez, A., Biddle, J. W., Steward, C. D., Alberti, S., Bush, K., & Tenover, F. C. (2001). Novel carbapenem-hydrolyzing beta-lactamase, KPC-1, from a carbapenem-resistant strain of *Klebsiella pneumoniae*. *Antimicrobial agents and chemotherapy*, 45(4), 1151-1161.
- Yong, D., Lee, K., Yum, J. H., Shin, H. B., Rossolini, G. M., & Chong, Y. (2002). Imipenem-EDTA Disk Method for Differentiation of Metallo-Lactamase-Producing Clinical Isolates of *Pseudomonas* spp. and *Acinetobacter* spp. *Journal of Clinical Microbiology*, 40(10), 3798-3801.
- Yong, D., Toleman, M. A., Bell, J., Ritchie, B., Pratt, R., Ryley, H., & Walsh, T. R. (2012). Genetic and biochemical characterization of an acquired subgroup B3 metallo- β -lactamase gene, bla AIM-1, and its unique genetic context in *Pseudomonas aeruginosa* from Australia. *Antimicrobial agents and chemotherapy*, 56(12), 6154-6159.
- Yong, D., Toleman, M. A., Giske, C. G., Cho, H. S., Sundman, K., Lee, K., & Walsh, T. R. (2009). Characterization of a new metallo- β -lactamase gene, bla NDM-1, and a novel erythromycin esterase gene carried on a unique genetic structure in *Klebsiella pneumoniae* sequence type 14 from India. *Antimicrobial agents and chemotherapy*, 53(12), 5046-5054.
- Yoon, E. J., Gwon, B., Liu, C., Kim, D., Won, D., Park, S. G., ... & Jeong, S. H. (2020). Beneficial Chromosomal Integration of the Genes for CTX-M Extended-Spectrum β -Lactamase in *Klebsiella pneumoniae* for Stable Propagation. *Msystems*, 5(5).
- Yu, F., Lv, J., Niu, S., Du, H., Tang, Y. W., Pitout, J. D., ... & Chen, L. (2018). Multiplex PCR analysis for rapid detection of *Klebsiella pneumoniae* carbapenem-resistant (sequence type 258 [ST258] and ST11) and hypervirulent (ST23, ST65, ST86, and ST375) strains. *Journal of clinical microbiology*, 56(9), e00731-18.
- Yu, W. L., Fung, C. P., Ko, W. C., & Chuang, Y. C. (2007). Polymerase chain reaction analysis for detecting capsule serotypes K1 and K2 of *Klebsiella pneumoniae* causing abscesses of the liver and other sites. *The Journal of infectious diseases*, 195(8), 1235-1235.
- Yu, W. L., Ko, W. C., Cheng, K. C., Lee, C. C., Lai, C. C., & Chuang, Y. C. (2008). Comparison of prevalence of virulence factors for *Klebsiella pneumoniae* liver abscesses between isolates with capsular K1/K2 and non-K1/K2 serotypes. *Diagnostic microbiology and infectious disease*, 62(1), 1-6.
- Yu, W. L., Ko, W. C., Cheng, K. C., Lee, H. C., Ke, D. S., Lee, C. C., ... & Chuang, Y. C. (2006). Association between rmpA and magA genes and clinical syndromes caused by *Klebsiella pneumoniae* in Taiwan. *Clinical infectious diseases*, 42(10), 1351-1358.
- Yuan, Y., Li, Y., Wang, G., Li, C., Chang, Y. F., Chen, W., ... & Zhang, L. (2019). bla NDM-5 carried by a hypervirulent *Klebsiella pneumoniae* with sequence type 29. *Antimicrobial Resistance & Infection Control*, 8(1), 1-9.
- Zahller, J., & Stewart, P. S. (2002). Transmission electron microscopic study of antibiotic action on *Klebsiella pneumoniae* biofilm. *Antimicrobial agents and chemotherapy*, 46(8), 2679-2683.
- Zhai, Y., He, Z., Kang, Y., Yu, H., Wang, J., Du, P., ... & Gao, Z. (2016). Complete nucleotide sequence of pH11, an IncHI2 plasmid conferring multi-antibiotic resistance and multi-heavy metal resistance genes in a clinical *Klebsiella pneumoniae* isolate. *Plasmid*, 86, 26-31.
- Zhang, S., Zhang, X., Wu, Q., Zheng, X., Dong, G., Fang, R., ... & Zhou, T. (2019). Clinical, microbiological, and molecular epidemiological characteristics of *Klebsiella pneumoniae*-induced pyogenic liver abscess in southeastern China. *Antimicrobial Resistance & Infection Control*, 8(1), 1-13.

- Zhang, Z. Y., Qin, R., Lu, Y. H., Shen, J., Zhang, S. Y., Wang, C. Y., Yang, Y. Q., Hu, F. P., & He, P. (2020). Capsular polysaccharide and lipopolysaccharide O type analysis of *Klebsiella pneumoniae* isolates by genotype in China. *Epidemiology and infection*, *148*, e191.
- Zhao, W. H., & Hu, Z. Q. (2011). Epidemiology and genetics of VIM-type metallo- β -lactamases in Gram-negative bacilli. *Future microbiology*, *6*(3), 317-333.
- Zheng, R., Zhang, Q., Guo, Y., Feng, Y., Liu, L., Zhang, A., Zhao, Y., Yang, X., & Xia, X. (2016). Outbreak of plasmid-mediated NDM-1-producing *Klebsiella pneumoniae* ST105 among neonatal patients in Yunnan, China. *Annals of clinical microbiology and antimicrobials*, *15*, 10.
- Zhou, K., Lokate, M., Deurenberg, R. H., Tepper, M., Arends, J. P., Raangs, E. G., Lo-Ten-Foe, J., Grundmann, H., Rossen, J. W., & Friedrich, A. W. (2016). Use of whole-genome sequencing to trace, control and characterize the regional expansion of extended-spectrum β -lactamase producing ST15 *Klebsiella pneumoniae*. *Scientific reports*, *6*, 20840.
- Zowawi, H. M., Forde, B. M., Alfaresi, M., Alzarouni, A., Farahat, Y., Chong, T. M., ... & Paterson, D. L. (2015). Stepwise evolution of pandrug-resistance in *Klebsiella pneumoniae*. *Scientific reports*, *5*(1), 1-8.