**Chapter 6**

**Nitrogen fixation**

Abadi, V. A. J. M. *et al*. (2021). Diversity and abundance of culturable nitrogen-fixing bacteria in the phyllosphere of maize. *Journal of Applied Microbiology* **131**(2), 898-912. <https://doi.org/10.1111/jam.14975>

Alleman, A. B. *et al*. (2021). Metabolic model of the nitrogen-fixing obligate aerobe *Azotobacter vinelandii* predicts its adaptation to oxygen concentration and metal availability. *mBio* **12**(6), 02593-21. <https://doi.org/10.1128/mBio.02593-21>

Basile, L. A. & Lepek, V. C. (2021). Legume–rhizobium dance: an agricultural tool that could be improved? *Microbial Biotechnology* **14**(5), 1897-1917. <https://doi.org/10.1111/1751-7915.13906>

Bertsova, Y. V. *et al*. (2021). The flavin transferase ApbE flavinylates the ferredoxin:NAD+-oxidoreductase Rnf required for N2 fixation in *Azotobacter vinelandii*. *FEMS Microbiology Letters* **368**(18), fnab130. <https://doi.org/10.1093/femsle/fnab130>

Chen, Y. *et al*. (2021). Nitrogen-fixing ability and nitrogen fixation-related genes of thermophilic fermentative bacteria in the genus *Caldicellulosiruptor*. *Microbes & Environments* **36**(2), ME21018. <https://doi.org/10.1264/jsme2.ME21018>

Ghodhbane-Gtari, F. *et al*. (2021). Alone yet not alone: *Frankia* lives under the same roof with other bacteria in actinorhizal nodules. *Frontiers in Microbiology* **12**, 3658. <https://www.frontiersin.org/article/10.3389/fmicb.2021.749760>

Gradoville, M. R. *et al*. (2021). Light and depth dependency of nitrogen fixation by the non-photosynthetic, symbiotic cyanobacterium UCYN-A. *Environmental Microbiology* **23**(8), 4518-4531. <https://doi.org/10.1111/1462-2920.15645>

Huang, M. *et al*. (2021). c-di-GMP homeostasis is critical for heterocyst development in *Anabaena* sp. PCC 7120. *Frontiers in Microbiology* **12**, 3698. <https://www.frontiersin.org/article/10.3389/fmicb.2021.793336>

Jing, X. *et al*. (2022). Anode respiration-dependent biological nitrogen fixation by *Geobacter sulfurreducens*. *Water Research* **208**, 117860. <https://doi.org/10.1016/j.watres.2021.117860>

Martien, J. I. *et al*. (2021). Metabolic remodeling during nitrogen fixation in *Zymomonas mobilis*. *mSystems* **6**(6), 00987-21. <https://doi.org/10.1128/mSystems.00987-21>

Mohr, W. *et al*. (2021). Terrestrial-type nitrogen-fixing symbiosis between seagrass and a marine bacterium. *Nature* **600**(7887), 105-109. <https://doi.org/10.1038/s41586-021-04063-4>

Oehlmann, N. N. & Rebelein, J. (in press). The conversion of carbon monoxide and carbon dioxide by nitrogenases. *ChemBioChem*. <https://doi.org/10.1002/cbic.202100453>

Rutten, P. J. & Poole, P. S. (2019). Oxygen regulatory mechanisms of nitrogen fixation in rhizobia. *Advances in Microbial Physiology* **75**,325-389. <https://doi.org/10.1016/bs.ampbs.2019.08.001>

Waite, C. J. *et al*. (2021). Resource allocation during the transition to diazotrophy in *Klebsiella oxytoca*. *Frontiers in Microbiology* **12**, 2194. <https://www.frontiersin.org/article/10.3389/fmicb.2021.718487>

**Amino acid synthesis**

Gutt, M. *et al*. (2021). High complexity of glutamine synthetase regulation in *Methanosarcina mazei*: Small protein 26 interacts and enhances glutamine synthetase activity. *The FEBS Journal* **288**(18), 5350-5373. <https://doi.org/10.1111/febs.15799>

**Nucleotide synthesis**

Alqurashi, A. *et al*. (2021). The flavodoxin FldA activates the class Ia ribonucleotide reductase of *Campylobacter jejuni*. *Molecular Microbiology* **116**(1), 343-358. <https://doi.org/10.1111/mmi.14715>

**Monomer synthesis – lipids**

Cronan, J. E. (2021). The classical, yet controversial, first enzyme of lipid synthesis: *Escherichia coli* acetyl-CoA carboxylase. *Microbiology & Molecular Biology Reviews* **85**(3), e00032-21. <https://journals.asm.org/doi/abs/10.1128/MMBR.00032-21>

Hays, C. *et al*. (2021). Type II fatty acid synthesis pathway and cyclopropane ring formation are dispensable during *Enterococcus faecalis* systemic infection. *Journal of Bacteriology* **203**(20), e00221-21. <https://journals.asm.org/doi/abs/10.1128/JB.00221-21>

**Monomer synthesis – others**

**Cell surface polymer synthesis**

Aggarwal, S. D. *et al*. (2021). A molecular link between cell wall biosynthesis, translation fidelity, and stringent response in *Streptococcus pneumoniae*. *Proceedings of the National Academy of Sciences of the USA* **118**(14), e2018089118. <https://www.pnas.org/content/pnas/118/14/e2018089118.full.pdf>

Atwal, S. *et al*. (2021). Discovery of a diverse set of bacteria that build their cell walls without the canonical peptidoglycan polymerase aPBP. *mBio* **12**(4), e01342-21. <https://journals.asm.org/doi/abs/10.1128/mBio.01342-21>

Bohrhunter, J. L. *et al*. (2021). MltG activity antagonizes cell wall synthesis by both types of peptidoglycan polymerases in *Escherichia coli*. *Molecular Microbiology* **115**(6), 1170-1180. <https://doi.org/10.1111/mmi.14660>

Jones, C. S. *et al*. (2021). Mechanism of *Staphylococcus aureus* peptidoglycan *O*-acetyltransferase A as an *O*-acyltransferase. *Proceedings of the National Academy of Sciences**of the USA* **118**(36), e2103602118. <https://www.pnas.org/content/pnas/118/36/e2103602118.full.pdf>

Kleetz, J. *et al*. (2021). Phospholipid *N*-methyltransferases produce various methylated phosphatidylethanolamine derivatives in thermophilic bacteria. *Applied & Environmental Microbiology* **87**(19), e01105-21. <https://journals.asm.org/doi/abs/10.1128/AEM.01105-21>

Liechti, G. W. (2021). Localized peptidoglycan biosynthesis in *Chlamydia trachomatis* conforms to the polarized division and cell size reduction developmental models. *Frontiers in Microbiology* **12**, 3816. <https://www.frontiersin.org/article/10.3389/fmicb.2021.733850>

Mueller, E. A. *et al*. (2021). The active repertoire of *Escherichia coli* peptidoglycan amidases varies with physiochemical environment. *Molecular Microbiology* **116**(1), 311-328. <https://doi.org/10.1111/mmi.14711>

Parthasarathy, S. *et al*. (2021). SigV mediates lysozyme resistance in *Enterococcus faecalis* via RsiV and PgdA. *Journal of Bacteriology* **203**(20), e00258-21. <https://journals.asm.org/doi/abs/10.1128/JB.00258-21>

Sardis, M. F. *et al*. (2021). The LpoA activator is required to stimulate the peptidoglycan polymerase activity of its cognate cell wall synthase PBP1a. *Proceedings of the National Academy of Sciences of the USA* **118**(35), e2108894118. <https://www.pnas.org/content/pnas/118/35/e2108894118.full.pdf>

Shaku, M. *et al*. (2020). Peptidoglycan biosynthesis and remodeling revisited. *Advances in Applied Microbiology* **112**,67-103. <https://doi.org/10.1016/bs.aambs.2020.04.001>

Straume, D. *et al*. (2021). Class A PBPs: it is time to rethink traditional paradigms. *Molecular Microbiology* **116**(1), 41-52. <https://doi.org/10.1111/mmi.14714>

Su, T. *et al*. (2020). Decoding capsule synthesis in *Streptococcus pneumoniae*. *FEMS Microbiology Reviews* **45**(4), fuaa067. <https://doi.org/10.1093/femsre/fuaa067>

Wu, X. *et al*. (2020). Wall teichoic acids: physiology and applications. *FEMS Microbiology Reviews* **45**(4), fuaa064. <https://doi.org/10.1093/femsre/fuaa064>

Xie, P. *et al*. (2021). Lipopolysaccharide transport system links physiological roles of σE and ArcA in the cell envelope biogenesis in *Shewanella oneidensis*. *Microbiology Spectrum* **9**(1), e00690-21.

**Cell wall, S-layer and surface structure assembly**

Armitage, J. P. & Berry, R. M. (2020). Assembly and dynamics of the bacterial flagellum. *Annual Review of Microbiology* **74**, 181-200. <https://www.annualreviews.org/doi/abs/10.1146/annurev-micro-090816-093411>

Bryant, O. J. *et al*. (2021). Chaperone-mediated coupling of subunit availability to activation of flagellar Type III secretion. *Molecular Microbiology* **116**(2), 538-549. <https://doi.org/10.1111/mmi.14731>

Delisle, J. *et al*. (2021). Characterization of TseB: A new actor in cell wall elongation in *Bacillus subtilis*. *Molecular Microbiology* **116**(4), 1099-1112. <https://doi.org/10.1111/mmi.14798>

Gurnani Serrano, C. K. *et al*. (2021). ActS activates peptidoglycan amidases during outer membrane stress in *Escherichia coli*. *Molecular Microbiology* **116**(1), 329-342. <https://onlinelibrary.wiley.com/doi/abs/10.1111/mmi.14712>

Kumari, P. *et al*. (2021). Sortase A: A chemoenzymatic approach for the labeling of cell surfaces. *Biotechnology & Bioengineering* **118**(12), 4577-4589. <https://doi.org/10.1002/bit.27935>

Park, K.-T. *et al*. (2021). FtsA acts through FtsW to promote cell wall synthesis during cell division in *Escherichia coli*. *Proceedings of the National Academy of Sciences of the USA* **118**(35), e2107210118. <https://www.pnas.org/content/pnas/118/35/e2107210118.full.pdf>

Rohs, P. D. A. & Bernhardt, T. G. (2021). Growth and division of the peptidoglycan matrix. *Annual Review of Microbiology* **75**, 315-336. <https://www.annualreviews.org/doi/abs/10.1146/annurev-micro-020518-120056>

Taguchi, A. *et al*. (2021). Biochemical reconstitution defines new functions for membrane-bound glycosidases in assembly of the bacterial cell wall. *Proceedings of the National Academy of Sciences of the USA* **118**(36), e2103740118. <https://www.pnas.org/content/pnas/118/36/e2103740118.full.pdf>

Tickner, J. *et al*. (2021). The Wzi outer membrane protein mediates assembly of a tight capsular polysaccharide layer on the *Acinetobacter baumannii* cell surface. *Scientific Reports* **11**. 21741. <https://doi.org/10.1038/s41598-021-01206-5>

Winkle, M. *et al*. (2021). DpaA detaches Braun's lipoprotein from peptidoglycan. *mBio* **12**(3), e00836-21. <https://journals.asm.org/doi/abs/10.1128/mBio.00836-21>

**Outer membrane assembly**

Diederichs, K. A. *et al*. (2021). Building better barrels – β-barrel biogenesis and insertion in bacteria and mitochondria. *Journal of Molecular Biology* **433**(16), 166894. <https://doi.org/10.1016/j.jmb.2021.166894>

Junglas, B. *et al*. (2021). PspA adopts an ESCRT-III-like fold and remodels bacterial membranes. *Cell* **184**(14), 3674-3688.e3618. <https://doi.org/10.1016/j.cell.2021.05.042>

Lee, S. F. *et al*. (2021). Identification of a thiol-disulfide oxidoreductase (SdbA) catalyzing disulfide bond formation in the superantigen SpeA in *Streptococcus pyogenes*. *Journal of Bacteriology* **203**(17), e00153-21. <https://journals.asm.org/doi/abs/10.1128/JB.00153-21>

**Replication and chromosome segregation**

Chan, H. *et al*. (in press). FtsK and SpoIIIE, coordinators of chromosome segregation and envelope remodeling in bacteria. *Trends in Microbiology*. <https://doi.org/10.1016/j.tim.2021.10.002>

Gallagher, K. A. & Brun, Y. V. (2021). Bacterial chromosome segregation: New insights into non-binary replication and division. *Current Biology* **31**(17), R1044-R1046. <https://doi.org/10.1016/j.cub.2021.07.032>

Gallay, C. *et al*. (2021). CcrZ is a pneumococcal spatiotemporal cell cycle regulator that interacts with FtsZ and controls DNA replication by modulating the activity of DnaA. *Nature Microbiology* **6**(9), 1175-1187. <https://doi.org/10.1038/s41564-021-00949-1>

Gogou, C. *et al*. (2021). Mechanisms for chromosome segregation in bacteria. *Frontiers in Microbiology* **12**, 1533. <https://www.frontiersin.org/article/10.3389/fmicb.2021.685687>

Greci, M. D. & Bell, S. D. (2020). Archaeal DNA Replication. *Annual Review of Microbiology* **74**, 65-80. <https://www.annualreviews.org/doi/abs/10.1146/annurev-micro-020518-115443>

Ha, K. P. & Edwards, A. M. (2021). DNA repair in *Staphylococcus aureus*. *Microbiology & Molecular Biology Reviews* **85**(4), e00091-21. <https://journals.asm.org/doi/abs/10.1128/MMBR.00091-21>

**Transcription and post-transcriptional modification**

Cronan, J. E. (2021). The *Escherichia coli* FadR transcription factor: Too much of a good thing? *Molecular Microbiology* **115**(6), 1080-1085. <https://doi.org/10.1111/mmi.14663>

Irastortza-Olaziregi, M. & Amster-Choder, O. (2021). Coupled transcription-translation in prokaryotes: An old couple with new surprises. *Frontiers in Microbiology* **11**, 3532.

Klein, C. A. *et al*. (2021). The bacterial promoter spacer modulates promoter strength and timing by length, TG-motifs and DNA supercoiling sensitivity. *Scientific Reports* **11**, 24399. <https://doi.org/10.1038/s41598-021-03817-4>

Martinez, G. S. *et al*. (2021). Characterization of promoters in archaeal genomes based on DNA structural parameters. *MicrobiologyOpen* **10**(5), e1230. <https://onlinelibrary.wiley.com/doi/abs/10.1002/mbo3.1230>

Martinez-Liu, L. *et al*. (2021). Comparative genomics of DNA-binding transcription factors in archaeal and bacterial organisms. *Plos One* **16**(7), e0254025. <https://doi.org/10.1371/journal.pone.0254025>

**Translation and protein folding**

Feaga, H. A. & Dworkin, J. (2021). Transcription regulates ribosome hibernation. *Molecular Microbiology* **116**(2), 663-673. <https://doi.org/10.1111/mmi.14762>

Hartman, M. C. T. (in press). Non-canonical amino acid substrates of *E. coli* aminoacyl-tRNA synthetases. *ChemBioChem* <https://doi.org/10.1002/cbic.202100299>

Serrão, V. H. B. *et al*. (2021). The specific elongation factor to selenocysteine incorporation in *Escherichia coli:* Unique tRNASec recognition and its interactions. *Journal of Molecular Biology* **433**(23), 167279. <https://doi.org/10.1016/j.jmb.2021.167279>

Shandell, M. A. *et al*. (2021). Genetic code expansion: A brief history and perspective. *Biochemistry* **60**(46), 3455-3469. <https://doi.org/10.1021/acs.biochem.1c00286>

Tirumalai, M. R. *et al*. (2021). The peptidyl transferase center: a window to the past. *Microbiology & Molecular Biology Reviews* **85**(4), e00104-21. <https://journals.asm.org/doi/abs/10.1128/MMBR.00104-21>

Vargas-Rodriguez, O. *et al*. (2021). Bacterial translation machinery for deliberate mistranslation of the genetic code. *Proceedings of the National Academy of Sciences of the USA* **118**(35), e2110797118. <https://www.pnas.org/content/pnas/118/35/e2110797118.full.pdf>

Wickner, S. *et al*. (2021). The bacterial Hsp90 chaperone: Cellular functions and mechanism of action. *Annual Review of Microbiology* **75**: 719-739. <https://www.annualreviews.org/doi/abs/10.1146/annurev-micro-032421-035644>

**Assembly of cellular structures**

Londei, P. & Ferreira-Cerca, S. (2021). Ribosome biogenesis in archaea. *Frontiers in Microbiology* **12**, 1476. <https://www.frontiersin.org/article/10.3389/fmicb.2021.686977>

**Cell division & growth**

Briggs, N. S. *et al*. (2021). The pneumococcal divisome: Dynamic control of *Streptococcus pneumoniae* cell division. *Frontiers in Microbiology* **12**, 2998. <https://www.frontiersin.org/article/10.3389/fmicb.2021.737396>

Dresen, M. *et al*. (2021). Identification and characterization of the cell division protein MapZ from *Streptococcus suis*. *MicrobiologyOpen* **10**(5), e1234. <https://doi.org/10.1002/mbo3.1234>

Galinier, A. *et al*. (2021). Metabolic control of cell elongation and cell division in *Bacillus subtilis*. *Frontiers in Microbiology* **12**, 1667. <https://www.frontiersin.org/article/10.3389/fmicb.2021.697930>

Garcia-Garcia, T. *et al*. (2021). Ser/Thr kinase-dependent phosphorylation of the peptidoglycan hydrolase CwlA controls its export and modulates cell division in *Clostridioides difficile*. *mBio* **12**(3), e00519-21. <https://journals.asm.org/doi/abs/10.1128/mBio.00519-21>

Marunga, J. *et al*. (2021). Identification of a genetically linked but functionally independent two-component system important for cell division of the rice pathogen *Burkholderia glumae*. *Frontiers in Microbiology* **12**, 1735. <https://www.frontiersin.org/article/10.3389/fmicb.2021.700333>

Perez, A. J. *et al*. (2021). Organization of peptidoglycan synthesis in nodes and separate rings at different stages of cell division of *Streptococcus pneumoniae*. *Molecular Microbiology* **115**(6), 1152-1169. <https://doi.org/10.1111/mmi.14659>

Salamaga, B. *et al*. (2021). Demonstration of the role of cell wall homeostasis in *Staphylococcus aureus* growth and the action of bactericidal antibiotics. *Proceedings of the National Academy of Sciences of the USA* **118**(44), e2106022118. <https://www.pnas.org/content/pnas/118/44/e2106022118.full.pdf>

Sher, J. W. *et al*. (2021). Polar growth in *Corynebacterium glutamicum* has a flexible cell wall synthase requirement. *mBio* **12**(3), e00682-21. <https://journals.asm.org/doi/abs/10.1128/mBio.00682-21>