

Chapter 13

Survival and energy

Biselli, E. *et al.* (2020). Slower growth of *Escherichia coli* leads to longer survival in carbon starvation due to a decrease in the maintenance rate. *Molecular Systems Biology* **16**(6), e9478.

Bradley, J. A. *et al.* (2020). Widespread energy limitation to life in global subseafloor sediments. *Science Advances* **6**(32), eaba0697.

<https://advances.sciencemag.org/content/advances/6/32/eaba0697.full.pdf>

Ni, B. *et al.* (2020). Growth-rate dependent resource investment in bacterial motile behavior quantitatively follows potential benefit of chemotaxis. *Proceedings of the National Academy of Sciences of the USA* **117**(1), 595-601.

<https://www.pnas.org/content/pnas/117/1/595.full.pdf>

Carbohydrate reserve materials

Wang, M. *et al.* (2020). Glycogen metabolism impairment via single gene mutation in the *glgBXCAP* operon alters the survival rate of *Escherichia coli* under various environmental stresses. *Frontiers in Microbiology* **11**, 2416.

<https://www.frontiersin.org/article/10.3389/fmicb.2020.588099>

Lipid reserve materials

Alsafadi, D. *et al.* (2020). Optimization of nitrogen source supply for enhanced biosynthesis and quality of poly(3-hydroxybutyrate-co-3-hydroxyvalerate) by extremely halophilic archaeon *Haloferax mediterranei*. *MicrobiologyOpen* **9**(8), e1055.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/mbo3.1055>

Martin, L. K. *et al.* (2021). Bacterial wax synthesis. *Biotechnology Advances* **46**, 107680.

<https://doi.org/10.1016/j.biotechadv.2020.107680>

Ye, J. *et al.* (2020). Stimulus response-based fine-tuning of polyhydroxyalkanoate pathway in *Halomonas*. *Metabolic Engineering* **57**, 85-95.

<https://doi.org/10.1016/j.ymben.2019.10.007>

Polypeptide reserve materials

Polyphosphate

Beaufay, F. *et al.* (2020). Polyphosphate functions *in vivo* as an iron chelator and fenton reaction inhibitor. *mBio* **11**(4), e01017-20.

<https://mbio.asm.org/content/mbio/11/4/e01017-20.full.pdf>

Resting cells

Sporulation

Craft, D. L. *et al.* (2020). Analysis of 5'-NAD capping of mRNAs in dormant spores of *Bacillus subtilis*. *FEMS Microbiology Letters* **367**(17), fnaa143.

<https://doi.org/10.1093/femsle/fnaa143>

Khanna, K. *et al.* (2020). Shaping an endospore: Architectural transformations during *Bacillus subtilis* sporulation. *Annual Review of Microbiology* **74**, 361–386.

<https://www.annualreviews.org/doi/abs/10.1146/annurev-micro-022520-074650>

Cysts

Harish, K. S. (2020). Molecular circuit of heterocyst differentiation in cyanobacteria. *Journal of Basic Microbiology* **60**(9), 738-745.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/jobm.202000266>

Viable but non-culturable (VBNC) cells

- Aktas, D. *et al.* (2020). Resuscitation of the *Helicobacter pylori* coccoid forms by resuscitation promoter factor obtained from *Micrococcus Luteus*. *Current Microbiology* **77**(9), 2093-2103. <https://doi.org/10.1007/s00284-020-02043-x>
- Fu, Y. *et al.* (2020). Induction of *Escherichia coli* O157:H7 into a viable but non-culturable state by high temperature and its resuscitation. *Environmental Microbiology Reports* **12**(5), 568-577. <https://doi.org/10.1111/1758-2229.12877>
- Jayakumar, J. M. *et al.* (2020). Synergistic role of abiotic factors driving viable but non-culturable *Vibrio cholerae*. *Environmental Microbiology Reports* **12**(4), 454-465. <https://sfamjournals.onlinelibrary.wiley.com/doi/abs/10.1111/1758-2229.12861>
- López-Lara, L. I. *et al.* (2020). Influence of rehydration on transcriptome during resuscitation of desiccated *Pseudomonas putida* KT2440. *Annals of Microbiology* **70**(1), 54. <https://doi.org/10.1186/s13213-020-01596-3>
- Wu, B. *et al.* (2020). Quorum sensing regulation confronts the development of a viable but non-culturable state in *Vibrio cholerae*. *Environmental Microbiology* **22**(10), 4314-4322. <https://doi.org/10.1111/1462-2920.15026>

Zhao, R. *et al.* (2020). Proteolytic activity of *Vibrio harveyi* YeaZ is related with resuscitation on the viable but non-culturable state. *Letters in Applied Microbiology* **71**(2), 126-133.
<https://sfamjournals.onlinelibrary.wiley.com/doi/abs/10.1111/lam.13304>

Persister cells

Clairmont, L. K. *et al.* (in press). Factors influencing the persistence of enteropathogenic bacteria in wetland habitats and implications for water quality. *Journal of Applied Microbiology*. <https://doi.org/10.1111/jam.14955>

Dawan, J. *et al.* (2020). Role of antibiotic stress in phenotypic switching to persister cells of antibiotic-resistant *Staphylococcus aureus*. *Annals of Microbiology* **70**(1), 1.
<https://doi.org/10.1186/s13213-020-01552-1>

Franklin, M. J. *et al.* (2020). Functional characterization of the *Pseudomonas aeruginosa* ribosome hibernation-promoting factor. *Journal of Bacteriology* **202**(19), e00280-20.
<https://jb.asm.org/content/jb/202/19/e00280-20.full.pdf>

Hingley-Wilson, S. M. *et al.* (2020). Loss of phenotypic inheritance associated with *ycdI* mutation leads to increased frequency of small, slow persisters in *Escherichia coli*. *Proceedings of the National Academy of Sciences of the USA* **117**(8), 4152-4157.
<https://www.pnas.org/content/pnas/117/8/4152.full.pdf>

Kaldalu, N. *et al.* (2020). *in vitro* studies of persister cells. *Microbiology & Molecular Biology Reviews* **84**(4), e00070-20. <https://mmbbr.asm.org/content/mmbbr/84/4/e00070-20.full.pdf>

Liu, L. *et al.* (2020). High persister cell formation by clinical *Staphylococcus aureus* strains belonging to clonal complex 30. *Microbiology* **166**(7), 654-658.
<https://doi.org/10.1099/mic.0.000926>

Masuda, Y. *et al.* (2020). Role of toxin-antitoxin-regulated persister population and indole in bacterial heat tolerance. *Applied & Environmental Microbiology* **86**(16), e00935-20.
<https://aem.asm.org/content/aem/86/16/e00935-20.full.pdf>

Mohiuddin, S. G. *et al.* (2020). Flow-cytometry analysis reveals persister resuscitation characteristics. *BMC Microbiology* **20**, 202. <https://doi.org/10.1186/s12866-020-01888-3>

Ovsepian, A. *et al.* (2020). Ciprofloxacin-induced persister-cells in *Campylobacter jejuni*.

Microbiology **166**(9), 849-853. <https://doi.org/10.1099/mic.0.000953>

Ross, B. N. *et al.* (2020). Predicting toxins found in toxin–antitoxin systems with a role in host-induced *Burkholderia pseudomallei* persistence. *Scientific Reports* **10**, 16923.

<https://doi.org/10.1038/s41598-020-73887-3>

Sulaiman, J. E. & Lam, H. (2020). Proteomic study of the survival and resuscitation mechanisms of filamentous persisters in an evolved *Escherichia coli* population from cyclic ampicillin treatment. *mSystems* **5**(4), e00462-20.

<https://msystems.asm.org/content/msys/5/4/e00462-20.full.pdf>

Talwar, S. *et al.* (2020). Role of VapBC12 toxin-antitoxin locus in cholesterol-induced mycobacterial persistence. *mSystems* **5**(6), e00855-20.

<https://msystems.asm.org/content/msys/5/6/e00855-20.full.pdf>

Nanobacteria

Beam, J. P. *et al.* (2020). Ancestral absence of electron transport chains in Patescibacteria and DPANN. *Frontiers in Microbiology* **11**, 1848.

<https://www.frontiersin.org/article/10.3389/fmicb.2020.01848>

Bernard, C. *et al.* (2020). Rich repertoire of quorum sensing protein coding sequences in CPR and DPANN associated with interspecies and interkingdom communication. *mSystems* **5**(5), e00414-20. <https://msystems.asm.org/content/msys/5/5/e00414-20.full.pdf>

Castelle, C. J. & Banfield, J. F. (2018). Major new microbial groups expand diversity and alter our understanding of the tree of life. *Cell* **172**(6), 1181-1197.

<http://www.sciencedirect.com/science/article/pii/S0092867418301600>

Fucich, D. & Chen, F. (2020). Presence of toxin-antitoxin systems in picocyanobacteria and their ecological implications. *The ISME Journal* **14**(11), 2843-2850.

<https://doi.org/10.1038/s41396-020-00746-4>

Nakai, R. (2020). Size matters: Ultra-small and filterable microorganisms in the environment.

Microbes & Environments **35**(2), ME20025. <https://doi.org/10.1264/jsme2.ME20025>

Nikolaeva, D. D. *et al.* (2020). Simplification of ribosomes in bacteria with tiny genomes.

Molecular Biology & Evolution **38**(1), 58-66. <https://doi.org/10.1093/molbev/msaa184>

Parks, D. H. *et al.* (2017). Recovery of nearly 8,000 metagenome-assembled genomes substantially expands the tree of life. *Nature Microbiology* **2**(11), 1533-1542.

<https://doi.org/10.1038/s41564-017-0012-7>

Programmed cell death

Popp, P. F. & Mascher, T. (2019). Coordinated cell death in isogenic bacterial populations:

Sacrificing some for the benefit of many? *Journal of Molecular Biology* **431**(23), 4656-4669. <http://www.sciencedirect.com/science/article/pii/S0022283619302311>

Ramisetty, B. C. M. & Sudhakari, P. A. (2020). ‘Bacterial Programmed Cell Death’: cellular altruism or genetic selfism? *FEMS Microbiology Letters* **367**(16), fnaa141.

<https://doi.org/10.1093/femsle/fnaa141>

Toxin-antitoxin systems

El Mortaji, L. *et al.* (2020). A peptide of a type I toxin–antitoxin system induces *Helicobacter pylori* morphological transformation from spiral shape to coccoids. *Proceedings of the National Academy of Sciences of the USA* **117**(49), 31398-31409.
<https://www.pnas.org/content/pnas/117/49/31398.full.pdf>

Findlay Black, H. *et al.* (2020). A competence-regulated toxin-antitoxin system in *Haemophilus influenzae*. *PLOS ONE* **15**(1), e0217255.
<https://doi.org/10.1371/journal.pone.0217255>

Fucich, D. & Chen, F. (2020). Presence of toxin-antitoxin systems in picocyanobacteria and their ecological implications. *The ISME Journal* **14**(11), 2843-2850.
<https://doi.org/10.1038/s41396-020-00746-4>

Li, Z. *et al.* (2020). Characteristic and role of chromosomal type II toxin-antitoxin systems locus in *Enterococcus faecalis* ATCC29212. *Journal of Microbiology* **58**(12), 1027-1036. <https://doi.org/10.1007/s12275-020-0079-3>

Masuda, Y. *et al.* (2020). Role of toxin-antitoxin-regulated persister population and indole in bacterial heat tolerance. *Applied & Environmental Microbiology* **86**(16), e00935-20.
<https://aem.asm.org/content/aem/86/16/e00935-20.full.pdf>

- Riffaud, C. *et al.* (2020). Cross-regulations between bacterial toxin-antitoxin systems: Evidence of an interconnected regulatory network? *Trends in Microbiology* **28**(10), 851-866. <https://doi.org/10.1016/j.tim.2020.05.016>
- Ross, B. N. *et al.* (2020). Predicting toxins found in toxin–antitoxin systems with a role in host-induced *Burkholderia pseudomallei* persistence. *Scientific Reports* **10**, 16923. <https://doi.org/10.1038/s41598-020-73887-3>
- Song, S. & Wood, T. K. (2020). A primary physiological role of toxin/antitoxin systems is phage inhibition. *Frontiers in Microbiology* **11**, 1895. <https://www.frontiersin.org/article/10.3389/fmicb.2020.01895>
- Talwar, S. *et al.* (2020). Role of VapBC12 toxin-antitoxin locus in cholesterol-induced mycobacterial persistence. *mSystems* **5**(6), e00855-20. <https://msystems.asm.org/content/msys/5/6/e00855-20.full.pdf>
- Wang, X. *et al.* (in press). Type VII toxin/antitoxin classification system for antitoxins that enzymatically neutralize toxins. *Trends in Microbiology*. <https://doi.org/10.1016/j.tim.2020.12.001>

Wu, A. Y. *et al.* (2020). Specialised functions of two common plasmid mediated toxin-antitoxin systems, *ccdAB* and *pemIK*, in *Enterobacteriaceae*. *PLOS ONE* **15**(6), e0230652. <https://doi.org/10.1371/journal.pone.0230652>

Zander, I. *et al.* (2020). Characterization of PfiT/PfiA toxin–antitoxin system of *Pseudomonas aeruginosa* that affects cell elongation and prophage induction. *Environmental Microbiology* **22**(12), 5048-5057. <https://doi.org/10.1111/1462-2920.15102>

Zaveri, A. *et al.* (2020). Depletion of the DarG antitoxin in *Mycobacterium tuberculosis* triggers the DNA-damage response and leads to cell death. *Molecular Microbiology* **114**(4), 641-652. <https://onlinelibrary.wiley.com/doi/abs/10.1111/mmi.14571>

Bacterial immune systems

Bernheim, A. *et al.* (2021). Prokaryotic viperins produce diverse antiviral molecules. *Nature* **589**(7840), 120-124. <https://doi.org/10.1038/s41586-020-2762-2>

Burroughs, A. M. & Aravind, L. (2020). Identification of uncharacterized components of prokaryotic immune systems and their diverse eukaryotic reformulations. *Journal of Bacteriology* **202**(24), e00365-20. <https://jb.asm.org/content/jb/202/24/e00365-20.full.pdf>

Fillol-Salom, A. *et al.* (2020). Beyond the CRISPR-Cas safeguard: PICI-encoded innate immune systems protect bacteria from bacteriophage predation. *Current Opinion in Microbiology* **56**, 52-58. <https://doi.org/10.1016/j.mib.2020.06.002>

Gao, L. *et al.* (2020). Diverse enzymatic activities mediate antiviral immunity in prokaryotes. *Science* **369**(6507), 1077-1084. <https://science.sciencemag.org/content/sci/369/6507/1077.full.pdf>

Jolly, S. M. *et al.* (2020). *Thermus thermophilus* argonaute functions in the completion of DNA replication. *Cell* **182**(6), 1545-1559.e1518. <https://doi.org/10.1016/j.cell.2020.07.036>

Liu, Z. *et al.* (2020). Application of different types of CRISPR/Cas-based systems in bacteria. *Microbial Cell Factories* **19**, 172. <https://doi.org/10.1186/s12934-020-01431-z>

Lowey, B. *et al.* (2020). CBASS Immunity uses CARF-related effectors to sense 3-5 and 2-5-linked cyclic oligonucleotide signals and protect bacteria from phage infection. *Cell* **182**(1), 38-49.e17. <https://doi.org/10.1016/j.cell.2020.05.019>

Meeske, A. J. *et al.* (2020). A phage-encoded anti-CRISPR enables complete evasion of type VI-A CRISPR-Cas immunity. *Science* **369**(6499), 54-59.
<https://science.sciencemag.org/content/sci/369/6499/54.full.pdf>

Molina, R. *et al.* (2020). Structural basis of CRISPR-Cas Type III prokaryotic defence systems. *Current Opinion in Structural Biology* **65**, 119-129.
<https://doi.org/10.1016/j.sbi.2020.06.010>

Nussenzweig, P. M. & Marraffini, L. A. (2020). Molecular mechanisms of CRISPR-Cas immunity in bacteria. *Annual Review of Genetics* **54**(1), 93-120.
<https://www.annualreviews.org/doi/abs/10.1146/annurev-genet-022120-112523>

Osuna, B. A. *et al.* (2020). *Listeria* phages induce Cas9 degradation to protect lysogenic genomes. *Cell Host & Microbe* **28**(1), 31-40.e39.
<https://doi.org/10.1016/j.chom.2020.04.001>

Osuna, B. A. *et al.* (2020). Critical anti-CRISPR locus repression by a bi-functional Cas9 inhibitor. *Cell Host & Microbe* **28**(1), 23-30.e25.

<https://doi.org/10.1016/j.chom.2020.04.002>

Peng, X. *et al.* (2020). Anti-CRISPR proteins in archaea. *Trends in Microbiology* **28**(11), 913-921. <https://doi.org/10.1016/j.tim.2020.05.007>

Rousset, F. & Bikard, D. (2020). CRISPR screens in the era of microbiomes. *Current Opinion in Microbiology* **57**, 70-77. <https://doi.org/10.1016/j.mib.2020.07.009>

Song, S. & Wood, T. K. (2020). A primary physiological role of toxin/antitoxin systems is phage inhibition. *Frontiers in Microbiology* **11**, 1895.

<https://www.frontiersin.org/article/10.3389/fmicb.2020.01895>

Watters, K. E. *et al.* (2020). Potent CRISPR-Cas9 inhibitors from *Staphylococcus* genomes. *Proceedings of the National Academy of Sciences of the USA* **117**(12), 6531-6539.

<https://www.pnas.org/content/pnas/117/12/6531.full.pdf>

Westra, E. R. & Levin, B. R. (2020). It is unclear how important CRISPR-Cas systems are for protecting natural populations of bacteria against infections by mobile genetic

elements. *Proceedings of the National Academy of Sciences of the USA* **117**(45), 27777-27785. <https://www.pnas.org/content/pnas/117/45/27777.full.pdf>

Wiegand, T. *et al.* (2020). Structures and strategies of anti-CRISPR-mediated immune suppression. *Annual Review of Microbiology* **74**, 21–37.

<https://www.annualreviews.org/doi/abs/10.1146/annurev-micro-020518-120107>

Yu, L. & Marchisio, M. A. (2020). Types I and V anti-CRISPR proteins: From phage defense to eukaryotic synthetic gene circuits. *Frontiers in Bioengineering & Biotechnology* **8**, 1117. <https://www.frontiersin.org/article/10.3389/fbioe.2020.575393>

Competence

Findlay Black, H. *et al.* (2020). A competence-regulated toxin-antitoxin system in *Haemophilus influenzae*. *PLOS ONE* **15**(1), e0217255.

<https://doi.org/10.1371/journal.pone.0217255>

Fonseca, D. R. *et al.* (2020). Type IV-like pili facilitate transformation in naturally competent archaea. *Journal of Bacteriology* **202**(21), e00355-20.

<https://jb.asm.org/content/jb/202/21/e00355-20.full.pdf>

She, Q. *et al.* (2020). Negative interplay between biofilm formation and competence in the environmental strains of *Bacillus subtilis*. *mSystems* **5**(5), e00539-20.

<https://msystems.asm.org/content/msys/5/5/e00539-20.full.pdf>

Yang, Y. *et al.* (2020). Designing cyclic competence-stimulating peptide (CSP) analogs with pan-group quorum-sensing inhibition activity in *Streptococcus pneumoniae*.

Proceedings of the National Academy of Sciences of the USA **117**(3), 1689-1699.

<https://www.pnas.org/content/pnas/117/3/1689.full.pdf>