REFERENCES

REFERENCES

Abdel-Hamid, A. M., Attwood, M. M., Guest, J. R. (2001). Pyruvate oxidase contributes to the aerobic growth efficiency of *Escherichia coli*. Microbiol, 147(6):1483-1498.

Abyzov, A., Urban, A. E., Snyder, M., Gerstein, M. (2011). An approach to discover, genotype, and characterize typical and atypical CNVs from family and population genome sequencing. Genome Research, 21(6):1549–5469.

Agarwal, L., Isar, J., Meghwanshi, G.K., Saxena, R.K. (2006). A cost-effective fermentative production of succinic acid from cane molasses and corn steep liquor by *Escherichia coli*. J. Appl. Microbiol, 100(6):1348–1354

Ahn, J. H., Jang, Y. S., Lee, S. Y. (2016). Production of succinic acid by metabolic engineered microorganisms. Curr Opin Biotechnol, 42:54-66.

Almqvist, H., Pateraki, C., Alexandri, M., Koutinas, A., Liden, G. (2016). Succinic acid production by *Actinobacillus succinogenes* from batch fermentation of mixed sugars. J Ind Microbiol Biotechnol, 43(8):1117-30.

Andersson, C., Hodge, D., Berglund KA., Rova, U. (2007). Effect of different carbon sources on the production of succinic acid using metabolically engineered *Escherichia coli*. Biotechnol Prog, 23(2):381–388.

Babitzke, P., Romeo, T. (2007). *CsrB* sRNA family: Sequestration of RNA-binding regulatory proteins. Curr Opin Microbiol, 10(2):156 –163.

Beauprez, J. J., De Mey, M., Soetaert, W.S. (2010). Microbial succinic acid production: Natural versus metabolic engineered producers. Process Biochem, 45(7):1103–1114.

Becke,r J., Reinefeld, J., Stellmacher, R., Scha fer, R., Lange, A., Meyer, H., Lalk, M., Zelder, O., Abendroth, G., Schro der, H. (2013). Systems-wide analysis and engineering of metabolic pathway fluxes in bio-succinate producing *Basfia succiniciproducens*. Biotechnol Bioeng, 110(11):3013-3023.

Berrios-Rivera, S. J., Bennett, G. N., San, K. Y. (2002a). The effect of increasing NADH availability on the redistribution of metabolic fluxes in *Escherichia coli* chemostat cultures. Metab Eng, 4(3):230–237.

Berrios-Rivera, S. J., Bennett, G. N., San, K. Y., (2002b). Metabolic engineering of *Escherichia coli*: increase of NADH availability by overexpressing an NAD(+)-dependent formate dehydrogenase. Metab Eng 4(3):217–229.

Bicker, M., Hirth, J., Vogel, H. (2003). Dehydration of fructose to 5-hydroxymethylfurfural in sub- and supercritical acetone. Green Chem, 5(2):280-284.

Biswas, R., Yamaoka, M., Nakayama, H., Kondo, T., Yoshida, K., Bisaria, V. S., Kondo, A. (2012). Enhanced production of 2,3-butanediol by engineered *Bacillus subtilis*. Appl Microbiol Biotechnol, 94(3):651-658.

Bozell, J. J., Petersen, G. R. (2010). Technology development for the production of biobased products from biorefinery carbohydrates-the US Department of Energy's "Top 10" revisited. Green Chem, 12(4):539–554.

Bryant, M. P., Bouma, C., Chu, H. (1958). *Bacteroides ruminicola n. sp.* and *Succinimonas amylolytica*; the new genus and species; species of succinic acid-producing anaerobic bacteria of the bovine rumen. J Bacteriol, 76(1):15-23.

Bryant, M. P., Small, N. (1956). Characteristics of two new genera of anaerobic curved rods isolated from the rumen of cattle. J Bacteriol, 72(1):22-26.

Carel, D.V. H., Willie, N. (2013). Continuous and batch cultures of *Escherichia coli* KJ134 for succinic acid fermentation: metabolic flux distributions and production characteristics. Microb Cell Fact, 12(80):1–10.

Carvalh, M., Roca, C., Reis, M. A. M. (2016). Improving succinic acid production by *Actinobacillus succinogenes* from raw industrial carob pods. Bioresour Technol, 218(1):49-497.

Cecchini, G., Schroder, I., Gunsalus, R. P., Maklashima, E. (2002). Succinate dehydrogenase and fumarate reductase from *Escherichia coli*. Biochim Biophys Acta, 1553(1-2):140-157.

Celinska, E. (2012). *Klebsiella* spp as a 1,3-propanediol producer-the metabolic engineering approach. Crit Rev Biotechnol, 32(3):274–288.

Chacon, S. J., Matias, G., Vieira, C. F. A., Ezeji, T. C., Filho, R. M., Mariano, A. P. (2020). Enabling butanol production from crude sugarcane bagasse hemicellulose hydrolysate by batch-feeding it into molasses fermentation. Ind. Crops Prod, 155: 112837.

Chan, S., Kanchanatawee, S., Jantama, K. (2012). Production of succinic acid from sucrose and sugarcane molasses by metabolically engineered *Escherichia coli*. Bioresour Technol, 103(1):329-336.

Chatterjee, R., Millard, C. S., Champion, K., Clark, D. P., Donnelly, M. I. (2001). Mutation of the *ptsG* Gene results in increased production succinate in fermentation of glucose by *Escherichia coli*. Appl Environ Microbiol, 67(1):148–154.

Chen, K., Zhang, H., Miao, Y., Jiang, M., Chen, J. (2010). Succinic acid production from enzymatic hydrolysate of sake lees using *Actinobacillus succinogenes* 130Z. Enzyme Microb Technol, 47(5):236-240.

Chen, K., Wallis J. W., Mclellan, M. D., Larson, D. E., Kalicki, J. M., Pohl, C. S., McGrath, S. D. (2009). BreakDancer: An algorithm for high-resolution mapping of genomic structural variation. Nat Methods, 6(9):677-681.

Chen, X., Wu, X., Jiang, S., Li, X. (2017). Influence of pH and neutralizing agent on anaerobic succinic acid production by a *Corynebacterium crenatum* strain. J Biosci Bioeng, 124(4):439-444.

Cheng, K. K., Zhao, X. B., Zeng, J., Zhang, J. A. (2012). Biotechnological production of succinic acid: current state and perspectives. Biofuel Bioprod Bior, 6(3):302-318.

Cheng, K. K., Wang, G. Y., Jing, Z., Zhang, J. A. (2013). Improved succinate production by metabolic engineering. Biomed Res Int, 538790:1-12.

Cheng, K. K., Wu, J., Wang, G. Y., Li, W. Y. Feng, J., Zhang, J. A. (2013). Effects of pH and dissolved CO_2 level on simultaneous production of 2,3 butanediol and succinate using *Klebsiella pneumoniae*. Bioresour Technol, 135:500-503.

Chang D.E., Shin S., Rhee J.S., Pan J.G. (1999). Acetate metabolism in a *pta* mutant of *Escherichia coli* W3110: importance of maintaining acetyl coenzyme a flux for growth and survival. J Bacteriol 81(21):6656-6663.

Cho, J., Rathnasingh, C., Song, H., Chung, B., Lee, H. J.,Seung, D. (2012). Fermentation and evaluation of *Klebsiella pneumoniae* and *K. oxytoca* on the production of 2,3-butanediol. Bioprocess Biosyst Eng, 35(7):1081-1088.

Cho, S., Kim, T., Woo, H. M., Kim, Y., Lee, J., Um, Y. (2015a). High production of 2,3-butanediol from biodiesel-derived crude glycerol by metabolically engineered *Klebsiella oxytoca* M1. Biotechnol Biofuel, 8(146):1-12.

Cho, S., Kim, T., Woo, H. M., Lee, J., Kim, Y., Um, Y. (2015b). Enhanced 2,3-butanediol production by optimizing fermentation conditions and engineering *Klebsiella oxytoca* M1 through overexpression of acetoin reductase. PLOS One, 10(9):0138109.

Clark, D. P. (1989). The fermentation pathways of *Escherichia coli*. FEMS Microbiol, 5(3):223-234.

Cock, P. J. A., Fields C. J., Goto N., Heuer, M. L., Rice, P. M. (2010). The Sanger FASTQ file format for sequences with quality scores, and the Solexa/Illumina FASTQ variants. Nucleic Acids Res, 38(6):1767–1771.

Davis, C. P., Cleven, D., Brown, J., Balish, E. (1976). *Anaerobiosprillium*, a new genus of spiral-shaped bacteria. Int J Syst Bacteriol, 26(4):498-504.

De Mey, M., Lequeux, G. J., Beauprez, J. J., Maertens, J., Horen, E. V., Soetaert, W. K., Vanrolleghem, P. A. (2007). Comparison of different strategies to reduce acetate formation in *Escherichia coli*. Biotechnol Prog, 23:1053–1063.

Dong, J. M., Taylor, J. M., Latour, D. J., Iuchi, S., Lin, E. C. (1993). Three overlapping *lct* genes involved in L-lactate utilization by *Escherichia coli*. J Bacteriol. 75(20):6671-8.

Drake, H. L., Gossner, A. S., Daniel, S. L. (2008). Old acetogens, new light. Ann N Y Acad Sci, 1125:100-128

Dumay, V., Danchin, A., Crasier, M. (1996). Regulation of *Escherichia coli* adenylate cyclase activity during hexose phosphate transport. Microbiology, 142:575-583

El-Mansi, E. M. T., Holms, W. H. (1989). Control of carbon flux to acetate excretion during growth of *Escherichia coli* in batch and continuous cultures. J Gen Microbiol, 135(11): 2875-2883.

Farmer, W.R., Liao, J.C. (1997). Reduction of aerobic acetate production by *Escherichia coli*. Appl Environ Microbiol, 63:3205-3210.

Felipe, F.L.d., Kleerebezem, M., Vos, W.M.d., Hugenholtz, J. (1998). Cofactor engineering: a novel approach to metabolic engineering in *Lactococcus lactis* by controlled expression of NADH oxidase. J. Bacteriol, 180:3804-3808.

Foster, J. W., Park, Y. K., Penfound, T., Fenger, T., Spector, M. P. (1990). Regulation of NAD metabolism in *Salmonella typhimurium*: molecular sequence analysis of the bifunctional *nadR* regulator and the *nadA-pnuC* operon. J Bacteriol. 172: 4187-4196.

Franchini, A., Ihssen, J., Egli, T. (2015). Effect of global regulators RpoS and cyclic-AMP/CRP on the catabolome and transcriptome of *Escherichia coli* K12 during carbon- and energy-limited growth. PLOS One, 10(7):e0133793.

Gao, C., Yang, X., Wang, H., Rivero, C. P., Chong, L., Cui, Z., Qi, Q., Lin, C. S. K. (2016). Robust succinic acid production from crude glycerol using engineered *Yarrowia lipolytica*. Biotechnol Biofuel, 9(179):1-11.

Garrity, G. M., Brenner, D. J., Krieg, N. R., Staley, J. T. (2004). Bergey's manual of systematic bacteriology the proteobacteria. East Lansing, MI: Springer, p. 2816.

Garvie, E. I. (1980). Bacterial lactate dehydrogenases. Microbiol Rev, 44:106–139.

Golyshina, O. V., Tran, H., Reva, O. N., Lemak, S., Yakunin, A. F., Goesmann, A., Nechitaylo, T. Y. (2017). Metabolic and evolutionary patterns in the extremely acidophilic archaeon *Ferroplasma acidiphilum* YT. Scientific Reports, 7(3682):1-12.

Guo, X., Fang, H., Zhuge, B., Zong, H., Song, J., Zhuge, J., Du, X. (2013). *budC* knockout in *Klebsiella pneumoniae* for bioconversion from glycerol to 1,3-propanediol. Biotechnol Appl Biochem, 60, 557–5

Grabar, T., Gong, W., Yocum, R. R. (2012). Metabolic evolution of *Escherichia coli* strains that produce organic acids. US patent 2012, US20120202259A1.

Guettler, M.V., Rumler, D., Jain, M. K. (1999). *Actinobacillus succinogenes* sp. nov., a novel succinic-acid-producing strain from the bovine rumen. Int J Syst Bacteriol, 49(1):207–216.

Guettler, M. V., Jain, M. K., Rumler, D. (1996a). Method for making succinic acid, bacterial variants for use in the process, and methods of obtaining variants. US patent, 5,573,931.

Guettler, M. V., Jain M. K., Soni B. K. (1996b). Process for making succinic acid, microorganisms for use in the process and methods of obtaining the microorganisms. US patent, 5,505,004.

Hantke, K., Winkler, K., Schultz, J. (2011). *Escherichia coli* Exports Cyclic AMP via TolC. J Bacteriol, 193(5):1086–1089.

Hesslinger, C., Fairhurst, S. A., Sawers, G. (1998). Novel keto acid formate-lyase and propionate kinase enzymes are components of an anaerobic pathway in *Escherichia coli* that degrades L threonine to propionate. Mol Microbiol, 27(2):477-492.

Heux, S., Cachon, R., Dequin, S. (2006). Cofactor engineering in *Saccharomyces cerevisiae*: expression of a H2O-forming NADH oxidase and impact on redox metabolism. Metab Eng, 8, 303–314

Hirasawa, T., Ookubo, A., Yoshikawa, K., Nagahisa, K., Furusawa, C., Sawai, H., Shimizu, H. (2009). Investigating the effectiveness of DNA microarray analysis for identifying the genes involved in L-lactate production by *Saccharomyces cerevisiae*, Appl Microbiol Biotechnol, 84(6):1149-1159.

Hu, Z., Patel, I. R., Mukherjee, A. (2013). Genetic analysis of the roles of *agaA*, *agaI*, and *agaS* genes in the N-acetyl-D-galactosamine and D-galactosamine catabolic pathways in *Escherichia coli* strains O157:H7 and C. BMC Microbiology, 13(94):1-16.

In, S., Khunnonkwao, P., Wong, N., Phosiran, C., Jantama, S. S., Jantama, K. (2020). Combining metabolic engineering and evolutionary adaptation *Klebsiella oxytoca* KMS004 to significantly improve optically pure D- (-)-lactic acid yield and specific productivity in low nutrient medium. Appl Microbiol Biotechnol, 104:9565-9579.

Isar, J., Agarwal, A., Saran, S., Saxena, R. K. (2006). Succinic acid production from *Bacteroides fragilis*: process optimization and scale up in a bioreactor. Anaerobe, 12(5-6):231-237.

Jarboe, L. R., Hyduke, D. R., Tran, L. M., Chou, K. J. Y., Liao, J. C. (2008). Determination of the *Escherichia coli* S-nitrosoglutathione response network using integrated biochemical and systems analysis. J Biol Chem, 283(8):5148–5157.

Jantama, K., Polyiam, P., Khunnonkwao, P., Chan, S., Sangproo, M., Khor, K., Kanchanatawe, S. (2015). Efficient reduction of the formation of by-products and improvement of production yield of 2,3-butanediol by a combined deletion of alcohol dehydrogenase, acetate kinase-phosphotransacetylase, and lactate dehydrogenase genes in metabolically engineered *Klebsiella oxytoca* in mineral salts medium. Metab Eng, 30:16-26.

Jantama, K., Haupt, M. J., Svoronos, S. A., Zhang, X., Moore, J. C., Shanmugam, K. T., Ingram, L. O. (2008a). Combining metabolic engineering and metabolic evolution to develop nonrecombinant strain of *Escheichia coli* C that produce succinate and malate. Biotechnol Bioeng, 99(5):1140-1153.

Jantama, K., Zhang, X., Moore, J. C., Svoronos, S. A., Shanmugam, K. T., Ingram, L. O. (2008b). Eliminating side products and increasing succinate yields in engineered strain of *Escherichia coli* C. Biotechnol Bioeng, 101(5):881-893.

Jantama, K., Haupt, M. J., Svoronos, S. A., Zhang, X., Moore, J. C., Shanmugam, K. T., Ingram, L. O. (2007). Combining metabolic engineering and metabolic evolution to develop nonrecombinant strains of *Escherichia coli* C that produce succinate and malate. Biotechnol Bioeng, 99(5):1140-1153.

Ji, J, X., Huang, H., Ouyang, P. K. (2011). Microbial 2,3-butanediol production: A state-of the-art review. Biotechnol Advances, 29(3):351-364.

Jiang, M., Ma, J., Wu, M., Liu, R., Liang, L., Xin, F., Zhang, W. (2017). Progress of succinic acid production from renewable resources: Metabolic and fermentative strategies. Bioresour Technol, 245(pt B):1710-1717.

Jiang, M., Dai, W., Xi, Y., Wu, M., Kong, X., Ma, J., Zhang, M. (2014). Succinic acid production from sucrose by *Actinobacillus succinogenes* NJ113. Bioresour Technol, 153:327-332.

Jiang, M., Xu, R., Xi, Y. L., Zhang, J. H., Dai, W. Y., Wan, Y. J, Chen, K. (2013). Succinic acid production from cellobiose by *Actinobacillus succinogenes*. Bioresour Technol, 135:469-474.

Joseph, E., Bernsley, C., Guiso, N., Ullmann, A. (1982). Multiple regulation of the activity of adenylate cyclase in *Escherichia coli*. Mol Gen Genet, 185(2):262-268.

Jung, M. Y., Mazumder, S., Shin, S. H., Yang, K. S., Lee, J., Oh, K. M. (2014). Improvement of 2,3-butanediol yield in *Klebsiella pneumoniae* by deletion of the pyruvate formate-lyase gene. Appl Environ Microbiol, 80(19):6195–6203.

Kawamoto, H., Morita, T., Shimizu, A., Inada, T., Aiba, H. (2015). Implication of membrane localization of target mRNA in the action of a small RNA: mechanism of post-transcriptional regulation of glucose transporter in *Escherichia coli*. Genes Dev, 19:328-338.

Khunnonkwao, P., Jantama, S. S., Kanchanatawee, S., Jantama, K. (2018). Re-engineering *Escherichia coli* KJ122 to enhance the utilization of xylose and xylose/glucose mixture for efficient succinate production in mineral salt medium. Appl Microbiol Biotechnol, 102:127-141

Kim, H. J., Jeong, H., Lee, S. J. (2022). Glucose transport through N-Acetylgalactosamine phosphotransferase system in *Escherichia coli* C strain. J. Microbiol Biotechnol, 32(8): 1047–1053.

Kim, B. Lee, S., Yang, J. Jeong, D, Shin, S. H., Kook, J. H. Yang, K. S. (2015). The influence of *budA* deletion on glucose metabolism related in 2,3-butanediol production by *Klebsiella pneumoniae*. Enzyme Microbl Technol, 73-74:1-8.

Kim, D. K., Parka, J. M., Songa, H., Chang, Y. K. (2016). Kinetic modelling of substrate and product inhibition for 2,3- butanediol production by *Klebsiella oxytoca*. Biochem Eng, 114:94–100.

Kim, D. K., Rathnasingh, C., Song, H., Lee, H. J., Seung, D., Chang, Y. K. (2013). Metabolic engineering of a novel *Klebsiella oxytoca* strain for enhanced 2,3-butanediol production. J Biosci Bioeng, 116(2):186-192.

Kim, H. J., Jeong, H., Lee, S. J. (2020). Short-term adaptation modulates anaerobic metabolic flux to succinate by activating ExuT, a novel D-glucose transporter in *Escherichia coli*. Front Microbiol, 11(27):1-10.

Kim, P., Laivenieks, M., Vieille, C., Zeikus, J.G. (2004). Effect of overexpression of *Actinobacillus succinogenes* phosphoenolpyruvate carboxykinase on succinate production in *Escherichia coli*. Appl Environ Microbiol, 70:1238-1241.

Kim, P., Laivenieks, M., McKinlay, J., Vieille, C., Zeikus J. G. (2004). Construction of a shuttle vector for the overexpression of recombinant proteins in *Actinobacillus succinogenes*. Plasmid, 51(2):108–115.

Kim, Y., Ingram L. O., Shanmugam, K.T. (2007). Construction of an *Escherichia coli* K-12 mutant for homoethanologenic fermentation of glucose or xylose without foreign genes. Appl Environ Microbiol, 73(6):1766–1771

Kimata, K., Tanaka, Y., Inada, T., Aiba, H. (2001). Expression of the glucose transporter gene, *ptsG*, is regulated at the mRNA degradation step in response to glycolytic flux in *Escherichia coli*. EMBO J. 20:3587–3595.

Knappe, J., Sawers, G. (1990). A radical-chemical route to acetyl~CoA: the anaerobically induced pyruvate formate-lyase system of *Escherichia coli*. FEMS Microbiol Rev, 6(4):383-398.

Kongjan, P., Thong, S. O., Angelidaki, I. (2011). Performance and microbial community analysis of two-stage process with extreme thermophilic hydrogen and thermophilic methane production from hydrolysate in UASB reactors. Bioresour Technol, 102(5):4028-4035.

Kornberg, H. (1966). The role and control of the glyoxylate cycle in *Escherichia coli*. Biochem J, 99(1):1–11.

Kumari, S., Tishel, R., Eisenbach, M., Wolfe, A. J. (1995). Cloning, characterization, and functional expression of acs, the gene which encodes acetyl coenzyme A synthetase in *Escherichia coli*. J Bacteriol, 177(10):2878-2886.

Lawrence, J. G., Roth, J. R. (1996). Evolution of coenzyme B12 synthesis among enteric bacteria: evidence for loss and reacquisition of a multigene complex. Genetics, 142(1):11-24.

Lee, J, W., Yi, J., Kim, T, Y., Choi, S., Ahn, J, H., Sonh, H., Lee, M.H., Lee, S. Y. (2016). Homo-succinic acid production by metabolically engineered *Mannheimia succiniciproducens*. Metabolic Engineering, 38:409-417.

Lee, S. J., Song, H., Lee, S. Y. (2006). Genome-based metabolic engineering of *Mannheimia succiniciproducens* for succinic acid production. Appl Environ Microbiol, 72(3):1939-1948.

Lee, S.Y., Lee, J.W., Choi, S., Yi, J. (2014). Mutant microorganism producing succinic acid simultaneously using sucrose and glycerol, and method for preparing succinic acid using same. US Patent Application US8691516B2.

Lee, P. C., Lee, S. Y., Hong, S. H., Chang, H. N. (2002). Isolation and characterization of new succinic acid producing bacterium *Mannheimia succiniciproducens* MBEL 55E from bovine rumen. Appl Microbiol Biotechnol, 58(5):663–668.

Lee, P. C., Lee, W. G., Kwon, S., Lee, S. Y., Chang, H. N. (1999). Succinic acid production by *Anaerobiospirillum succiniciproducens*: effects of the H2/CO_2 supply and glucose concentration. Enzyme Microb Technol, 24(8-9):549–554.

Lee, S. J., Lee, D. Y., Kim, T. Y., Kim, B. H., Lee, J. W., Lee, S. Y. (2005). Metabolic engineering of *Escherichia coli* for enhanced production of succinic acid, based on genome comparison and in silico gene knockout simulation. Appl Environ Microbiol 71:7880-7887.

Leibeke, M., Liebeke, M., Mader, D., Lalk, M., Peschel, A., Gotz, F. (2011). Pyruvate formate lyase acts as a formate supplier for metabolic processes during anaerobiosis in *Staphylococcus aureus*. J Bacteriol. 193(4):952-962.

Li, X., Zhang, W., Wu, M., Xin, F., Dong, W., Wu, H., Zhang, M. (2017). Performance and mechanism analysis of succinate production under different transporters in *Escherichia coli*. Biotechnol Bioproc Eng, 22:529-538.

Li, Q., Wu, H., Li, Z.M., Ye, Q. (2016). Enhanced succinate production from glycerol by engineered *Escherichia coli* strains. Bioresour Technol, 218:217-223.

Li, Y., Wang, X., Ge, X. Z., Tian, P. F. (2016). High production of 3-hydroxypropionic acid in *Klebsiella pneumoniae* by systematic optimization of glycerol metabolism. Sci Rep, 27(6):26932.

Lin, M., Whitmire, S., Chen, J. Farrel, A., Shi, X., Guo, J. T. (2017). Effects of short indels on protein structure and function in human genomes. SCientifiC Reports, 7: 9313.

Lin, H., Bennett, G. N., & San, K. Y. (2005). Fed-batch culture of a metabolically engineered *Escherichia coli* strain designed for high-level succinate production and yield under aerobic conditions. Biotechnol Bioeng, 90(6):775-779.

Ling, E.T.M., Dibble, J.T., Houston, M.R., Lockwood, L.B., Elliott, L.P. (1978). Accumulation of 1-trans-2,3-epoxysuccinic acid and succinic acid by *Paecilomyces varioti*. Appl Environ Microbiol, 35(6):1213-1215.

Liu, W., Zheng, P., Yu, F., Yang, Q. (2015). A two-stage process foe succinate production using genetically engineered *Corynebacterium acetoacidophilum*. Process Biochem, 50(11):1692-1700.

Liu, R.M., Liang, L.Y., Li, F., Wu, M.K., Chen, K.Q., Ma, J.F., Jiang, M. (2013). Efficient succinic acid production from lignocellulosic biomass by simultaneous utilization of glucose and xylose in engineered *Escherichia coli*. Bioresour Technol, 149:84-91.

Liu, Y. P., Zheng, P., Sun, Z. H., Ni, Y., Dong, J. J., Zhu, L.L. (2008). Economical succinic acid production from cane molasses by *Actinobacillus succinogenes*. Bioresour Technol, 99:1736–1742.

Liu, P., Jarboe, L. R. (2012). Metabolic engineering of biocatalysts for carboxylic acids production. Comput Struct Biotechnol, 3:e201210011.

Liu, M. Y., Gui, G., Wei, B., Preston, J. F., Oakford, L., Giedroc, D. P., Romeo, T. (1997). The RNA molecule CsrB binds to the global regulatory protein CsrA and antagonizes its activity in *Escherichia coli*. J Biol Chem, 272(28):17502–17510.

Luchi, S., Aristarkhov, A., Dong, M. J., Taylor, J. S., Lin, E.C. (1994). Effects of nitrate respiration on expression of the Arc-controlled operons encoding succinate dehydrogenase and flavin-linked L-lactate dehydrogenase. J Bacteriol, 176(6):1695-1701.

Mahon, C. R., Lehman, D. C., Manuselis, G. (2007). Diagnostic microbiol. Saunders, USA, 321, 373, 383, 527.

Martin, V. J. J., Pitera, D. J., Withers, S. T., Newman, J. D., Keasling, J. D. (2003). Engineering a mevalonate pathway in *Escherichia coli* for production of terpenoids. Nat Biotechnol, 21:796-802.

Martinez, A., Grabar, T.B., Shanmugam, K.T., Yomano, L.P., York, S. W., Ingram, L.O. (2007). Low salt medium for lactate and ethanol production by recombinant *Escherichia coli* B. Biotechnol Lett, 29(3):397-404.

McKee, A.E., Rutherford, B. J., Chivian, D.C., Baidoo, E.K., Juminaga, D., Kuo, D., Benke, P.I. (2012). Manipulation of the carbon storage regulator system for metabolite remodelling and biofuel production in *Escherichia coli*. Microb Cell Fact, 11:79

McKinlay, J.B., Zeikus, J.C.V. (2007). Prospects for a bio-based succinate industry. Appl Microbiol Biotechnol, 76(4):727-740.

Mokley, W.C., Eitenman, M.A. (2021). Pyruvate production by *Escherichia coli* by use of pyruvate dehydrogenase variants. Appl Environ Microbiol, 87:e00487-21.

Nakano, M.Y. Dailly, P., Zuber, D. Clark. (1997). Characterization of anaerobic fermentative growth of *Bacillus subtilis*: identification of fermentation end products and genes required for growth. J. Bacteriol. 179:6749-6755.

Nghiem, N.P., Kleff, S., Schwegmann, S. (2017). Succinic acid: technology development and commercialization. Fermentation, 3(26):1-14.

Nghiem, N.P., Davison, B.H., Suttle, B.E., Richardson, G.R. (1997). Production of succinic acid by *Anaerobiospirillum succiniciproducens*. Appl Biochem Biotechnol, 63(65):565–576.

Nishimura, Y., Tan, I. K. P., Ohgami, Y., Kohgami, K., Kamihara, T. (1983). Induction of membrane-bound L-lactate dehydrogenase in *Escherichia coli* under conditions of nitrate respiration, fumarate reduction and trimethylamine-N-oxide reduction. FEMS Microbiol Lett, 17(1-3):283-286.

Okino, S., Noburyu, R., Suda, M., Jojima, T., Inui, M., Yukawa, H. (2008). An efficient succinic acid production process in a metabolically engineered *Corynebacterium glutamicum* strain. Appl Microbiol Biotechnol, 81(3):459–464.

Olaiuyin, A.M., Yang, M., Thygesen, A., Tian, J., Mu, T., Xing, J. (2019). Effective production of succinic acid from coconut water (*Cocos nucifera*) by metabolically engineered *Escherichia coli* with overexpression of *Bacillus subtilis* pyruvate carboxylase. Biotechnology Reports, 24(e00378):1-7.

Olesen, J., Hahn, S., Guarente, L. (1987). Yeast HAP2 and HAP3 activators both bind to the CYC1 upstream activation site, USA2, in an interdependent manner. Cell, 51(6):953-961.

Ookubo, A., Hirasawa, T., Yoshikawa, K., Nagahisa, K., Furusawa, C., Shimizu, H. (2008) Improvement of L-lactate production by CYB2 gene disruption in a recombinant *Saccharomyces cerevisiae* strain under low pH condition. Biosci Biotechnol Biochem, 72(11):3063-3066.

Pagel, K.A., Antaki, D., Lian, A., Mort, M., Cooper, D.N., Sebat, J., Iakoucheva, L.M. (2019). Pathogenicity and functional impact of non-frameshifting insertion/deletion variation in the human genome. PLoS Comput Biol, 15(6):1007112.

Park, S.J., McCabe, J., Turna, J., Gunsalus, R.P. (1994). Regulation of the citrate synthase (*gitA*) gene of *Escherichia coli* in response to anaerobiosis and carbon supply: role of the *arcA* gene product. J Bacteriol, 176(16):5086-5092.

Perry, R.H., Green D.W., Malone, J.O. (1997). Perry's chemical engineers' Handbook, The McGraw-Hill Companies, seventh edition.

Portnoy, V.A., Scott, D.A., Lewis, N.E., Tarasova, Y., Osterman, A.L., Palsson, B.O. (2010). Deletion of genes encoding cytochrome oxidases and quinol monooxygenase blocks the aerobic-anaerobic shift in *Escherichia coli* K-12 MG1655. Appl Environ Microbiol, 76(19):6529-6540.

Qi, G., Kang, Y., Li, L., Xiao, A., Zhang, S., Wen, Z., Xu, D., Chen, S. (2014). Deletion of meso-2,3-butanediol dehydrogenase gene *budC* for enhanced D-2,3-butanediol production in *Bacillus licheniformis*. Biotechnol Biofuels, 29(7):1-16.

Reed, J.L., Vo, T.D., Schilling, C.H., Palsson, B. Q. (2003). An expanded genome-scale model of *Escherichia coli* K-12 (iJR904 GSM/GPR). Genome Biol, 4: R54.

Rodriguez, J., Kleerebezem, R., Lema, J.M., Loosdrecht, M.C.M. (2006). Modeling product formation in anaerobic mixed culture fermentations. Biotechnol Bioeng, 93(3):592-606.

Rosenbaum, F.P., Poehlein, A., Egelkamp, R., Daniel, R. Harder, S., Schluter, H., Schoelmerich, M. (2021). Lactate metabolism in strictly anaerobic microorganisms with a soluble NAD+-dependent L-lactate dehydrogenase. Environ Microbiol, 23(8):4661-467

Rossi, C., Hauber, J., Singer, T. P. (1964). Mitochondrial and cytoplasmic enzymes for the reduction of fumarate to succinate in yeast. Nature, 204:167-70.

Saier, M.HJr., Ramseier, T.M. (1996). The catabolite repressor/activator (*Cra*) protein of enteric bacteria. J Bacteriol 178:3411-3417.

San, K.Y., Bennett, G.N., Berríos-Rivera, S.J., Vadali, R.V., Yang, Y.T., Horton, E., Rudolph, F.B. (2002). Metabolic engineering through cofactor manipulation and its effects on metabolic flux redistribution in *Escherichia coli*. Metab Eng, 4(2):182–192.

Sanchez, A.M., Bennett, G.N., San, K.Y. (2005). Effect of different levels of NADH availability on metabolic fluxes of *Escherichia coli* chemostat cultures in defined medium. J. Biotechnol, 117(4):395-405.

Sanchez, A.M., Bennett, G.N., San, K.Y. (2005). Novel pathway engineering design of the anaerobic central metabolic pathway in *Escherichia coli* to increase succinate yield and productivity. Metab Eng, 7(3):229–239.

Sangproo, M., Polyiam, P., Jantama, S.S., Kanchanatawee, S., Jantama, K. (2012). Metabolic engineering of *Klebsiella oxytoca* M5a1 to produce optically pure D-lactate in mineral salts medium. Bioresour Technol, 119(114):191-198.

Sawers, G., Bock, A. (1998). Anaerobic regulation of pyruvate formate-lyase from *Escherichia coli* K12. J Bacteriol, 170(11):5330-5336.

Saxena, R.K., Saran, S., Isar, J., Kaushik, R. (2017). Production and applications of succinic acid. Current developments in biotechnology and bioengineering, p.601-630

Scheifinger C.C., Wolin M.J. (1973). Propionate formation from cellulose and soluble sugars by combined cultures of *Bacteroides succinogenes* and *Selenomonas ruminantium*. Appl Microbiol, 26(5):789-795.

Scholten, E., Haefner, S., Schro der, H. (2014). Bacterial cells having a glyoxylate shunt for the manufacture of succinic acid. US patent, US8877466B2.

Scholten, E., Da gele, D., Haefner, S., Schro der, H. (2013). Bacterial strain and process for the fermentative production of organic acids. US patent, US8574875B2.

Scholten, E., Daegele, D., Haefner, S., Schroeder, H. (2011). Novel microbial succinic acid producer. US patent, US20110300589.

Selina Wamucii, (2022). Molasses price in US - 2022 prices and charts. Available from: https://www.selinawamucii.com/insights/prices/united-states-of-america/molasses. August 15, 2022.

Sharma, S., Sarma, S.J., Brar, S.K. (2020). Bio-succinic acid: an environment-friendly platform chemical. International Journal of Environment and Health Sciences, 2(2):69-80.

Shukla, V.B., Zhou, S., Yomano, L.P., Shanmugam, K.T., Preston, J.F., Ingram, L.O. (2004). Production of D (-)-lactate from sucrose and molasses. Biotechnol Lett, 26:689-693.

Singh, A., Lynch, M.D., Gill, R.T. (2009). Genes restoring redox balance in fermentation-deficient *E. coli* NZN111. Metabol Eng, 11(6):347-354.

Smyth, H.F., Carpenter, C.P., Weil, C.S., Pozzani, U.C., Striegel, J.A., Nycum, J.S. (1962). Range-finding toxicity data: list IV. Am Ind Hyg Assoc J, 23(2):95-107.

Song, H., Lee, S.Y. (2006). Production of succinic acid by bacterial fermentation. Enzyme Microb Technol, 39(3):352-361.

Suzuki, K., Wang, X., Weilbacher, T., Pernesting, A.K., Melefors, O., Georgellis, D., Babitzke, P. (2002) Regulatory circuitry of the *CsrA/CsrB* and *BarA/UvrY* systems of *Escherichia coli*. J Bacteriol, 184(18):5130-5140.

Takahashi, S., Miyachi, M., Tamaki, H., Suzuki, H. (2021). The *Escherichia coli CitT* transporter can be used as a succinate exporter for succinate production. Biosci Biotechnol Biochem, 85(4):981-988

Tohsato, Y., Baba, T., Mazaki, Y., Ito, M., Wanner, B.L., Mori, H. (2010). Environmental dependency of gene knockouts on phenotype microarray analysis in *Escherichia coli*. J Bioinform Comput Biol, 8(1):83–99.

Van, M.A., Geertman, J.M., Vermeulen, A., Groothuizen, M.K., Winkler, A.A., Piper, M.D., Dijken, J.P., Pronk, J.T. (2004). Directed evolution of pyruvate decarboxylase-negative *Saccharomyces cerevisiae*, yielding a C2-independent, glucose-tolerant, and pyruvate-hyperproducing yeast. Appl Environ Microbiol, 70(1):159-166.

Van der Werf, M.J., Guettler, M.V., Jain, M.K., Zeikus J.G. (1997). Environmental and physiological factors affecting the succinate product ratio during carbohydrate fermentation by *Actinobacillus* sp. 130Z. Arch Microbiol, 167(6):332-342.

Vaswani (2010). Bio-based succinic acid. Process Economics Program. 14:1-42.

Wang, X., Dong, Q., Chen, G. Zhang, J., Liu, Y., Cai, Y. (2022). Frameshift and wild-type proteins are often highly similar because the genetic code and genomes were optimized for frameshift tolerance. BMC genomics, 23(416):1-15.

Wang, J., Zhao, P., Li, Y., Xu, L., Tian, P. (2018). Engineering CRISPR interference system in *Klebsiella pneumoniae* for attenuating lactic acid synthesis. Microb Cell Fact, 17(56):1-12.

Wang, J., Zhu, J., Bennett, G.N., San, K.Y. (2011). Succinate production from different carbon sources under anaerobic conditions by metabolic engineered *Escherichia coli* strains. Meta Eng, 13:328-335.

Wang, K., Li, M., Hakonarson, H. (2010). Functional annotation of genetic variants from high-throughput sequencing data. Nucleic Acids Res, 38(16):e164.

Warnecke, T., Gill, R. T. (2005). Organic acid toxicity, tolerance, and production in *Escherichia coli* biorefining applications. Microb Cell Fact, 4(25):1-8.

Weilbacher, T., Suzuki, K., Dubey, A.K., Wang, X., Gudapaty, S., Morizov, I., Baker, C.S. (2003). A novel sRNA component of the carbon storage regulatory system of *Escherichia coli* Molecular Microbiology, 48(3):657–670.

Werpy, T. A., (2004). Top value added chemicals from biomass: I. results of screening for potential candidates from sugars and synthesis gas. Synth Fuels.

Wittmann C. (2007). Fluxome analysis using GC–MS. Microb Cell Factories, 6:6.

Wojtusik, M., Rodríguez Ripoll, V., Santos, V.E., García, J.L., Ochoa F.G. (2015). 1,3 propanediol production by *Klebsiella oxytoca* NRRLB199 from glycerol. Medium composition and operational conditions. Biotechnol Reports, 17(6):100-107.

Wood, B.E., Yomano, L.P., York, S.W., Ingram, L.O. (2005). Development of industrial medium required elimination of the 2,3-butanediol fermentation pathway to maintain ethanol yield in an ethanologenic strain of *Klebsiella oxytoca*. Biotechnol Prog, 21(5):1366-1372.

Wood, W. A. (1961). Fermentation of carbohydrates and related compounds. In: Gunsalus IC, Stainer RY (eds). The bacteria, vol 2. Academic Press, New York London, pp 59-149.

Wu, H., Li, Z. M., Zhou, L., Ye, Q. (2007). Improved succinic acid production in the anaerobic culture of an *Escherichia coli pflB ldhA* double mutant as a result of enhanced anaplerotic activities in the preceding aerobic culture. Appl Environ Microbiol, 73(24):7837-7843.

Xiao, M., Xu, Z., Zhao, J., Wang, Z., Zuo, F., Zhang, J., Ren, F., Li, P., Chen, S., Ma H. (2011). Oxidative stress-related responses of *Bifidobacterium longum* subsp. longum BBMN68 at the proteomic level after exposure to oxygen. Microbiol, 157(6): 1573-1588.

Xu., K., Xu., P. (2014). Efficient production of L-lactic acid using co-feeding strategy based on cane molasse/glucose carbon source. Bioresour Technol, 15:23-29.

Yang, T.H., Rathnasingh, C., Lee, H.J., Seung, D. (2014). Identification of acetoin reductases involved in 2,3-butanediol pathway in *Klebsiella oxytoca*. J Biotechnol, 172:59-66.

Yu, J.H., Zhu, L. W., Xia, S.T., Li, H.M., Tang, Y.L., Liang, X.H., Chen, T. (2016). Combinatorial optimization of CO_2 transport and fixation to improve succinate production by promoter engineering. Biotechnol Bioeng, 113(7):1531-1541.

Zeikus, J.G., Jain, M.K., Elankovan, P. (1999). Biotechnology of succinic acid production and markets for derived industrial products. Appl Microbiol Biotechnol, 51(5):545-552.

Zhao, C., Cheng, L., Wang, J., Shen, Z., Chen, N. (2016). Impact of deletion of the genes encoding acetate kinase on production of L-tryptophan by *Escherichia coli.* Ann Microbiol, 66:261–269.

Zhang, H., Naikun, S., Qin, Y., Zhu, J., Li, Y., Jiafa, W., Jiang, M.G. (2018). Complete genome sequence of *Actinobacillus succinogenes* GXAS137, a highly efficient producer of succinic acid. Genome Announc, 6(8):e01562–17.

Zhang, X., Jantama, K., Moore, J.C., Jarboe, L.R., Shanmugam, K.T., Ingram, L.O. 2009. Metabolic evolution of energy-conserving pathways for succinate production in *Escherichia coli*. Proc.Natl Acad Sci, 106(48):20180-20185.

Zhiyong, C., Cuijuan, G. B., Jiaojiao, L., Jin, H., Carol Sze, K.L., Qingsheng, Q. (2017). Engineering of unconventional yeast *Yarrowia lipolytica* for efficient succinic acid production from glycerol at low pH. Metab Eng, 42(1):126-133.

Zhoa, C., Lin, Z., Dong, H., Zhang, Y., Li, Y. (2017). Reexamination of the physiological role of *PykA* in *Escherichia coli* revealed that it negatively regulates the intracellular ATP levels under anaerobic conditions. Appl Environ Microbiol, 83(11): e00316-17.

Zhou, L., Tian, K. M, Zuo, Z.R., Chen, X.Z., Shi, G.Y., Singh, S., Wang, Z.X. (2011). Elimination of succinate and acetate synthesis in recombinant *Escherichia coli* for D-lactate production. Chin J Biotechnol, 27(1):31–40.

Zhou, S., Iverson, A.G., Grayburn, W.S. (2008). Engineering a native homoethanol pathway in *Escherichia coli* B for ethanol production. Biotechnol Lett 30(2):335-342.

Zhu, X., Tan, Z., Xu, H., Chen, J., Zhang, X. (2014). Metabolic evolution of two reducing equivalent-conserving pathways for high-yield succinate production in *Escherichia coli*. Metab Eng, 24:87-96.

Zhu, J., Shimizu, K. (2004). The effect of *pfl* genes knockout on the metabolism for optically pure D-lactate production by *Escherichia coli*. Appl Microbiol Biotechnol, 64(3):367-375.

Zubay G. (1998). The tricarboxylic acid cycles. In: Biochemistry. 4th ed. USA: Macmillan Publishing Company, p. 481-508.

Zuo, F., Yu, R., Khaskhel, G.B., Ma, H., Chen, L., Zeng, Z., Mao, A., Chen, S. (2014). Homologous overexpression of alkyl hydroperoxide reductase subunit C (*ahpC*) protects *Bifidobacterium longum* strain NCC2705 from oxidative stress. Research Microbiol, 165(7):581-59.