

DAFTAR PUSTAKA

- Ahmad M, Hirz M, Pichler H, & Schwab H. (2014). Protein expression in *Pichia pastoris*: Recent achievements and perspectives for heterologous protein production. *Appl Microbiol Biotechnol.* <https://doi.org/doi:10.1007/s00253-014-5732-5>
- Allen, D., Ruan, C.-H., King, B., & Ruan, K.-H. (2019). Recent advances and near future of insulin production and therapy. *Future Medicinal Chemistry*, 11(13), 1513–1517. <https://doi.org/10.4155/fmc-2019-0134>
- Alyas, Ej., Rafiq, A., Amir, H., Khan, S. U., Sultana, T., Ali, A., Hameed, A., Ahmad, I., Kazmi, A., Sajid, T., & Ahmad, A. (2021). Human Insulin: History, Recent Advances, and Expression Systems for Mass Production. *Biomedical Research and Therapy*, 8(9), 4540–4561. <https://doi.org/10.15419/bmrat.v8i9.692>
- Anang, A., Indrijani, H., & Tasripin, D. (2010). *Analisis Efek Tetap dalam Evaluasi Genetik Produksi Susu pada Sapi Perah Menggunakan Catatan Test Day di Indonesia*. 15(2).
- Azadi, S., Mahboubi, A., Naghdi, N., Solaimanian, R., & Alireza, S. (2017). Evaluation of Sorbitol-Methanol Co-Feeding Strategy on Production of Recombinant Human Growth Hormone in *Pichia Pastoris*. *Shaheed Beheshti University of Medical Sciences and Health Services*.
- Baeshen MN, Bouback TA, Alzubaidi MA, & Bora RS. (2016). *Expression and purification of C peptide containing insulin using Pichia pastoris expression system*. *BioMed Res Int* 2016:1-7. <https://doi.org/doi:10.1155/2016/3423685>
- Baeshen, N. A., Baeshen, M. N., Sheikh, A., Bora, R. S., Ahmed, M. M. M., Ramadan, H. A. I., Saini, K. S., & Redwan, E. M. (2014). Cell factories for insulin production. *Microbial Cell Factories*, 13(1), 141. <https://doi.org/10.1186/s12934-014-0141-0>
- Bank Indonesia. (2023). *Statistik Ekonomi dan Keuangan Indonesia (SEKI)*.
- Batt, C. A. (2014). *Pichia Pastoris*. In *Encyclopedia of Food Microbiology* (pp. 42–46). Elsevier. <https://doi.org/10.1016/B978-0-12-384730-0.00254-8>
- Bhandari, B. K., Lim, C. S., Remus, D. M., Chen, A., van Dolleweerd, C., & Gardner, P. P. (2021). Analysis of 11,430 recombinant protein production experiments reveals that protein yield is tunable by synonymous codon changes of translation initiation sites. *PLOS Computational Biology*, 17(10), e1009461. <https://doi.org/10.1371/journal.pcbi.1009461>
- Bio-Rad. (2010). *Quality Control Products & Services Catalog*.

- Çelik, E., Çalık, P., & Oliver, S. G. (2009). Fed-batch methanol feeding strategy for recombinant protein production by *Pichia pastoris* in the presence of co-substrate sorbitol. *Yeast*, 26(9), 473–484. <https://doi.org/10.1002/yea.1679>
- Chen, L., Mohsin, A., Chu, J., Zhuang, Y., Liu, Y., & Guo, M. (2017). Enhanced protein production by sorbitol co-feeding with methanol in recombinant *Pichia pastoris* strains. *Biotechnology and Bioprocess Engineering*, 22(6), 767–773. <https://doi.org/10.1007/s12257-017-0011-9>
- Depkes RI. (1979). *Farmakope Indonesia Edisi III*. Direktorat Jendral Pengawasan Obat Dan Makanan. Jakarta.
- DiPiro, J. T., Yee, G. C., Posey, L. M., & Haines, S. T. (Eds.). (2020). *Pharmacotherapy: A pathophysiologic approach* (Eleventh edition). McGraw Hill Medical.
- Duran Group. (2013). *Laboratory Glassware, Thermometers & Micro Slides*. Duran Riviera Glass.
- Eddy Afrianto. (2008). *Pengawasan Mutu Bahan/Produk Pangan*.
- Endah Rita, Dyah Ayu Widyastuti, & Atip Nurwahyunani. (2021). *Buku Ajar Bioteknologi*. Universitas PGRI Semarang PRESS.
- Gaffar, S., Permana, D., & Subroto, T. (2011). *Pengaruh Konsentrasi Penginduksi Metanol Serta Sumber Karbon Sorbitol dan Monitol Terhadap Produksi Amylase Saccharomyces fibuligera R64 dalam Pichia pastoris*.
- Gao, M.-J., Li, Z., Yu, R.-S., Wu, J.-R., Zheng, Z.-Y., Shi, Z.-P., Zhan, X.-B., & Lin, C.-C. (2012). Methanol/sorbitol co-feeding induction enhanced porcine interferon- α production by *P. pastoris* associated with energy metabolism shift. *Bioprocess and Biosystems Engineering*, 35(7), 1125–1136. <https://doi.org/10.1007/s00449-012-0697-1>
- GenScript. (2017). *SurePAGE™ gels precast*.
- Goldberg I. (1994). Functional Food. New York: Chapman Hall.
- Gurramkonda C, Adnan A, Ross A, Nemani S K, & Swaminathan S. (2009). *Microbiologi Cell. Fact*.
- Hafsan, Zulkarnain, hajrah, & Makmur, K. (2022). *Prinsip dan Aplikasi Bioteknologi* [Preprint]. Open Science Framework. <https://doi.org/10.31219/osf.io/y8mwh>
- Hartini, M. (2016). Pengaruh Variasi Fase Minyak Virgin Coconut Oil dan Medium-Chain Triglycerides Oil Terhadap Stabilitas Fisik Nanoemulsi Minyak Biji Delima Dengan Kombinasi Surfaktan Tween 80 dan Span 80. *Fakultas Farmasi Universitas Sanata Dharma*.
- Herawati, N. (2015). *Pichia pastoris :YEAST PENGHASIL PROTEIN TERAPEUTIK DAN VAKSIN MANUSIA*.

- Herawati, N., Kusumawati, A., & Santoso, A. (2018). *Pichia pastoris: Sel Ragi Untuk Produksi Protein Rekombinan.* BERITA BIOLOGI, 17(2). <https://doi.org/10.14203/beritabiologi.v17i2.3644>
- Invitrogen. (1999). *Protein gel electrophoresis technical handbook.*
- Invitrogen. (2010). *EasySelectTM Pichia.*
- Karbalaei, M., Rezaee, S. A., & Farsiani, H. (2020). *Pichia pastoris: A highly successful expression system for optimal synthesis of heterologous proteins.* Journal of Cellular Physiology, 235(9), 5867–5881. <https://doi.org/10.1002/jcp.29583>
- Kjeldsen T, Pettersson A F, & Hach M. (1999). *Biotechnol. Appl.* 29, 79–86.
- Kotijah, D. S., & Ventyrina, I. (2019). *PENGATURAN BAKU MUTU BIOTEKNOLOGI.*
- Lee, B. H. (2015). *Fundamentals of Food Biotechnology* (Second Edition). WILEY Blackwell.
- Li, C., Xia, J.-Y., Chu, J., Wang, Y.-H., Zhuang, Y.-P., & Zhang, S.-L. (2013). CFD analysis of the turbulent flow in baffled shake flasks. *Biochemical Engineering Journal*, 70, 140–150. <https://doi.org/10.1016/j.bej.2012.10.012>
- Linder, Ed. M. C. (1991). *Nutritional biochemistry and metabolism.* USA : Appleton & Lange.
- M. Ahmad, M. Hirz, H. Pichler, & H. Schwab. (2014). *Protein expression in Pichia pastoris: Recent achievements and perspectives for heterologous protein production,* Appl. Microbiol. Biotechnol. 98. <https://doi.org/10.1007/s00253-014-5732-5>.
- Magliano, D., Boyko, E. J., Balkau, B., & Barengo, N. (2021). *IDF diabetes atlas* (10th edition). International Diabetes Federation.
- Niu, H., Jost, L., Pirlot, N., Sassi, H., Daukandt, M., Rodriguez, C., & Fickers, P. (2013). A quantitative study of methanol/sorbitol co-feeding process of a *Pichia pastoris* Mut+/pAOX1-lacZ strain. *Microbial Cell Factories*, 12(1), 33. <https://doi.org/10.1186/1475-2859-12-33>
- Nurdiani, D., Hariyatun, H., & Kusharyoto, W. (2018). Secretory expression of human insulin precursor in *Pichia pastoris* employing truncated α-factor leader sequence and a short C-peptide. *Indonesian Journal of Biotechnology*, 23(2), 102. <https://doi.org/10.22146/ijbiotech.38958>
- Nurdiani, D., Hariyatun, H., Utami, N., Putro, E. W., & Kusharyoto, W. (2022). Enhancement in Human Insulin Precursor Secretion by *Pichia pastoris* through Modification of Expression Conditions. *HAYATI Journal of Biosciences*, 29(1), 22–30. <https://doi.org/10.4308/hjb.29.1.22-30>
- Pekarsky, A., Veiter, L., Rajamanickam, V., Herwig, C., Grünwald-Gruber, C., Altmann, F., & Spadiut, O. (2018). Production of a recombinant peroxidase

- in different glyco-engineered *Pichia pastoris* strains: A morphological and physiological comparison. *Microbial Cell Factories*, 17(1), 183. <https://doi.org/10.1186/s12934-018-1032-6>
- Polez, S., Origgi, D., Zahariev, S., Guarnaccia, C., Tisminetzky, S. G., Skoko, N., & Baralle, M. (2016). A Simplified and Efficient Process for Insulin Production in *Pichia pastoris*. *PLOS ONE*, 11(12), e0167207. <https://doi.org/10.1371/journal.pone.0167207>
- Putro, E. W., Nurdiani, D., Hariyatun, -, Utami, N., Kusharyoto, W., Juanssilfero, A. B., & Silvia, R. A. (2022). Evaluating Pulses and Modified Fed-batch Feeding of Methanol to Increase Expression Level of Human Insulin Precursor in *Pichia Pastoris* High-Density Cultivation. *International Journal on Advanced Science, Engineering and Information Technology*, 12(3), 1001. <https://doi.org/10.18517/ijaseit.12.3.15109>
- Putro, E. W., Nurdiani, D., Hariyatun, Utami, N., & Kusharyoto, W. (2021). Capture and intermediate purification of human insulin precursor from *Pichia pastoris* culture using cation exchange chromatography. *IOP Conference Series: Earth and Environmental Science*, 762(1), 012028. <https://doi.org/10.1088/1755-1315/762/1/012028>
- Quianzon CC, Cheikh I. (2012). *History of insulin. J Community Hosp Intern Med Perspect 2:1-3.* <https://doi.org/10.3402/jchimp.v2i2.18701>
- Rahmadi, F. (2010). Optimasi Parameter Proses Pemesinan CNC Milling Terhadap Kekasaran Permukaan Baja ST 40 Dengan Metode Taguchi. *Fakultas Keguruan Dan Ilmu Pendidikan Universitas Sebelas Maret*.
- Rodrigues, D., Pillaca-Pullo, O., Torres-Obreque, K., Flores-Santos, J., Sánchez-Moguel, I., Pimenta, M. V., Basi, T., Converti, A., Lopes, A. M., Monteiro, G., Fonseca, L. P., & Pessoa, A. Jr. (2019). Fed-Batch Production of *Saccharomyces cerevisiae* L-Asparaginase II by Recombinant *Pichia pastoris* MUTs Strain. *Frontiers in Bioengineering and Biotechnology*, 7, 16. <https://doi.org/10.3389/fbioe.2019.00016>
- Sambrook, J., & Russell, D. W. (2012). *Molecular cloning: A laboratory manual* (4th ed). Cold Spring Harbor Laboratory Press.
- Santoso, A., Herawati, N., & Rubiana, Y. (2012). Effect of Methanol Induction and Incubation Time on Expression of Human Erythropoietin in Methylotrophic Yeast *Pichia pastoris*. *MAKARA of Technology Series*, 16(1). <https://doi.org/10.7454/mst.v16i1.1041>
- Satya Darmayani, Rudy Hidana, & Eni Setyowati. (2021). *Bioteknologi Teori dan Aplikasi*. Widina Bhakti Persada Bandung.
- Satyana Rayana, T., Johri, B. N., & Anil Prakash (Eds.). (2012). *Microorganisms in Sustainable Agriculture and Biotechnology*. Springer Netherlands. <https://doi.org/10.1007/978-94-007-2214-9>

- Selikhanov, G., Atamas, A., Yukhimchuk, D., Fufina, T., Vasilieva, L., & Gabdulkhakov, A. (2023). Stabilization of Cereibacter sphaeroides Photosynthetic Reaction Center by the Introduction of Disulfide Bonds. *Membranes*, 13(2), 154. <https://doi.org/10.3390/membranes13020154>
- Shang-Tian Yang. (2007). *Bioprrocessing for value-added product from renewable resources New Technologies and Applications*. In Shang-Tian Yang (Ed.), Elsevier Science & Technology (Issue January). Elsevier Science & Technology.
- Smith, J. E. (2009). *Biotechnology* (In Cambridge University Press (5th ed.)). Cambridge University Press.
- Soesilo, S. & diyatri. (2005). Peranan Sorbitol dalam Mempertahankan Kestabilan pH Saliva pada Proses Pencegahan Karies.Majalah Kedokteran Gigi. *Majalah Kedokteran Gigi*, 38.
- Suharti, P., & Rahmayati, K. (2019). *Panduan Praktikum Biodeverity Kehidupan Mikroorganisme*. UMSurabaya Publishing.
- Sukarno, D. A. (2021). Pengaruh Latihan Fisik terhadap Perbaikan Resistensi Insulin. *KELUWIH: Jurnal Kesehatan dan Kedokteran*, 2(2), 110–114. <https://doi.org/10.24123/kesdok.V2i2.4033>
- Tim Riskesdas. (2019). *Laporan Nasional RISKESDAS 2018*. Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan (LPB).
- Utami, N., Nurdiani, D., Hariyatun, H., Putro, E. W., Patria, F. P., & Kusharyoto, W. (2023). Full-length versus truncated α -factor secretory signal sequences for expression of recombinant human insulin precursor in yeast *Pichia pastoris*: A comparison. *Journal of Genetic Engineering and Biotechnology*, 21(1), 67. <https://doi.org/10.1186/s43141-023-00521-w>
- Utami, N., Nurdiani, D., Hariyatun, Putro, E. W., & Kusharyoto, W. (2021). Construction of a full length α -factor secretory signal sequence for human insulin precursor expression in *Pichia pastoris*. *IOP Conference Series: Earth and Environmental Science*, 762(1), 012066. <https://doi.org/10.1088/1755-1315/762/1/012066>
- Vecchio, I., Tornali, C., Bragazzi, N. L., & Martini, M. (2018). The Discovery of Insulin: An Important Milestone in the History of Medicine. *Frontiers in Endocrinology*, 9, 613. <https://doi.org/10.3389/fendo.2018.00613>
- Vinet, L., & Zhedanov, A. (2011). A ‘missing’ family of classical orthogonal polynomials. *Journal of Physics A: Mathematical and Theoretical*, 44(8), 085201. <https://doi.org/10.1088/1751-8113/44/8/085201>
- Wang Y, Liang Z H, Zhang Y, Yao S Y, & Tang Y H. (2001). Biotechnol. Bioeng, 73, 74–79.
- Wang, Z., Wang, Y., Zhang, D., Li, J., Hua, Z., Du, G., & Chen, J. (2010). Enhancement of cell viability and alkaline polygalacturonate lyase

- production by sorbitol co-feeding with methanol in *Pichia pastoris* fermentation. *Bioresource Technology*, 101(4), 1318–1323. <https://doi.org/10.1016/j.biortech.2009.09.025>
- Winiati P. Rahayu, Siti Nurjanah, & Ema Komalasari. (2018). *Escherichia coli: Patogenesis, Analisis dan Kajian Risiko*. Penerbit IPB Press.
- World Health Organization. (2019). *Classification of diabetes mellitus*. World Health Organization. <https://apps.who.int/iris/handle/10665/325182>
- Wu, J., Gong, G., Han, S., Zhang, W., Hu, Y., & Xie, L. (2019). Expression, purification, and characterization of the Degludec precursor DesB30. *Protein Expression and Purification*, 161, 28–39. <https://doi.org/10.1016/j.pep.2019.04.010>
- Xie T, Liu Q, Xie F, Liu H, & Zhang Y. (2008). Prep. Biochem. *Biotechnol.*, 3(38).
- Zhu, T., You, L., Gong, F., Xie, M., Xue, Y., Li, Y., & Ma, Y. (2011). Combinatorial strategy of sorbitol feeding and low-temperature induction leads to high-level production of alkaline β -mannanase in *Pichia pastoris*. *Enzyme and Microbial Technology*, 49(4), 407–412. <https://doi.org/10.1016/j.enzmictec.2011.06.022>