UNIVERSITAS
GADJAH MADA
PEMODELAN MATEMATIKA INFEKSI HIV DENGAN INSIDENSI SATURASI DALAM PENULARAN SEL-KE-SEL DAN RESPONS IMUN SEL T CITOTOKSIK
Novida Butar Butar, Prof.Dr.Fajar Adi Kusumo, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

Adams, B. M., Banks, H. T., Davidian, M., Kwon, Hee-Dae, Tran, H. T., Wynne, S. N., & Rosenberg, E. S.(2005).Hiv dynamics: Modeling, data analysis, and optimal treatment protocols.*Journal of Computational and Applied Mathematics*, 184(1), 10-49.

Bocharov, G., Ludewig, B., Bertoletti, A., Klenerman, P., Junt, T., Krebs, P., Luzyanina, T., Fraser, C. & Anderson, R. M. (2004). Underwhelming the immune response: Effect of slow virus growth on cd8+-t-lymphocyte responses. *Journal of Virology*, 78(5), 2247-2254.

Boyce, W.E. dan Diprima, R.C., 2001, *Elementary Differential Equations and Boundary Value Problems*,Von Hoffman Press, New York.

Chen, C. dan Zhou, Y. (2023). Dynamic analysis of hiv model with a general incidence, ctls immune response and intracellular delays. *Mathematics and Computers in Simulation*, 212, 159-181.

Chen, W., Zhang, L., Wang, N. & Teng, Z. (2024). Bifurcation analysis and chaos for a double-strains hiv coinfection model with intracellular delays, saturated incidence and logistic growth. *Mathematics and Computers in Simulation*, 223, 617-641.

Deeks, S. G., Overbaugh, J., Phillips, A., & Buchbinder, S. (2015). HIV infection. *Nature Reviews Disease Primers*, 1(1).

Detikcom. (2025). *Horor! 1.214 kasus HIV/AIDS di Sulsel didominasi seks sesama pria*. *Detik News*, 19 September 2025, diakses 2 Oktober 2025.

Engelman, A. dan Cherepanov, P. (2012). The structural biology of hiv-1: Mechanistic and therapeutic insights. *Nature Reviews Microbiology*, 10(4), 279-290.

UNIVERSITAS
GADJAH MADA
PEMODELAN MATEMATIKA INFEKSI HIV DENGAN INSIDENSI SATURASI DALAM PENULARAN SEL-KE-SEL DAN RESPONS IMUN SEL T CITOTOKSIK
Novida Butar Butar, Prof.Dr.Fajar Adi Kusumo, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Gallo, R.C. dan Montagnier, L.(2003). The discovery of HIV as the cause of AIDS. *N Engl J Med*. Dec 11;349(24):2283-5.

Gomez-Acevedo, H., Li, M. Y. & Jacobson, S. (2009). Multistability in a model for ctl response to htlv-i infection and its implications to ham/tsp development and prevention. *Bulletin of Mathematical Biology*, 72(3), 681-696.

Hale, J.K., Buttanri, H., & Kocak, H.(2012).*Dynamics and Bifurcations*,ISBN.9781461244264,Springer New York.

Hladik, F. dan McElrath, M. J. (2008). Setting the stage: Host invasion by hiv. *Nature Reviews Immunology*, 8(6), 447-457.

Iwami, S., Takeuchi, J. S., Nakaoka, S., Mammano, F., Clavel, F., Inaba, H., Kobayashi, T., Misawa, N., Aihara, K., Koyanagi, Y., & Sato, K. (2015). Cell-to-cell infection by HIV contributes over half of virus infection. *eLife*, 4, e08150.

Jiang, W., Kang, L., Lu, H., Pan, X., Lin, Q., Pan, Q., Xue, Y., Weng, X. & Tang, Y. (2004). Normal values for cd4 and cd8 lymphocyte subsets in healthy chinese adults from shanghai. *Clinical and Vaccine Immunology*, 11(4), 811-813.

Jiang, C., Wang, K. & Song, L. (2017). Global dynamics of a delay virus model with recruitment and saturation effects of immune responses. *Mathematical Biosciences and Engineering*, 14(5/6), 1233-1246.

Khaitan, A. dan Unutmaz, D. (2011). Revisiting Immune Exhaustion During HIV Infection. *Current HIV/AIDS Reports*, 8(1), 4-11.

Kementerian Kesehatan RI. *Laporan HIV AIDS dan PIMS Triwulan 1 tahun 2025*, April 2025, diakses 2 Oktober 2025.

Kurosh, A. G., 1984,*Higher Algebra* (terj. George Yankovsky)., Mir Publishers, Moscow.

Kuznetsov,Y.A.,2022, *Elements of Applied Bifurcations Theory, 4 th Edition*, Applied Mathematical Sciences Vol. 112 , Springer : Verlag , New-York,USA.

UNIVERSITAS
GADJAH MADA
PEMODELAN MATEMATIKA INFEKSI HIV DENGAN INSIDENSI SATURASI DALAM PENULARAN SEL-KE-SEL DAN RESPONS IMUN SEL T CITOTOKSIK
Novida Butar Butar, Prof.Dr.Fajar Adi Kusumo, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Lai, N., Farman, A. & Byrne, H.M. (2025).The Impact of T-cell Exhaustion Dynamics on Tumour?Immune Interactions and Tumour Growth. *Bull Math Biol*, 87, 61.

Liu, Z. dan Zhou, T. (2024). Analysis of global stability and bifurcation for an hiv infection model with cell to cell transmission.*Advances in Continuous and Discrete Models*, 60,2731-4235.

Lorenzo-Redondo, R., Fryer, H., Bedford, T., Kim, E., Archer, J., Pond, S. L. K., Chung, Y., Penugonda, S., Chipman, J.G., Fletcher, C.V., Schacker, T.W., Malim, M.H., Rambaut, A., Haase, A.T., McLean, A.R., & Wolinsky, S.M. (2016).Persistent HIV-1 replication maintains the tissue reservoir during therapy. *Nature*, 530, 51-56.

Ma, X., Zhang, Y. & Chen, Y. (2021). Stability and bifurcation analysis of an hiv-1 infection model with a general incidence and ctl immune response. *Journal of Biological Dynamics*, 15(1), 367-394.

Maartens, G., Celum, C. & Lewin, S. R. (2014). Hiv infection: Epidemiology, pathogenesis, treatment, and prevention. *The Lancet*, 384(9939), 258-271.

Monel, B., Beaumont, E., Vendrame, D., Schwartz, O., Brand, D., & Mammano, F. (2012). HIV cell-to-cell transmission requires the production of infectious virus particles and does not proceed through env-mediated fusion pores. *Journal of virology*, 86(7), 3924-3933.

Munier, C. M. L., Kelleher, A. D., Kent, S. J. & Rose, R. D. (2013). The role of t cell immunity in hiv-1 infection. *Current Opinion in Virology*, 3(4), 438-446.

Nowak, M. dan Bangham, C. (1996). Population Dynamics of Immune Responses to Persistent Viruses. *Science*, 272, 74-79.

Nowak, M. A., dan May, R. M. (2000). *Virus dynamics: Mathematical principles of immunology and virology*. Oxford University Press.

UNIVERSITAS
GADJAH MADA
PEMODELAN MATEMATIKA INFEKSI HIV DENGAN INSIDENSI SATURASI DALAM PENULARAN SEL-KE-SEL DAN RESPONS IMUN SEL T CITOTOKSIK
Novida Butar Butar, Prof.Dr.Fajar Adi Kusumo, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Oktarina, D. R., Susilawati, Y. & Halimah, E. (2021). The potential of phyllanthus genus plants as immunomodulatory and anti inflammatory. *Indonesian Journal of Biological Pharmacy*, 1(2), 47-77.

Olsder, G.J.,2011, *Mathematical Systems Theory, 4 th Edition*, Delftse Uitgevers Maatschappij, CW Delft, Netherlands.

Perelson, A. S., Kirschner, D. E., & De Boer, R. (1993).Dynamics of HIV infection of CD4+ T cells. *Mathematical Biosciences*, 114(1), 81-125.

Perelson, A. S., Neumann, A. U., Markowitz, M., Leonard, J. M., & Ho, D. D. (1996). HIV-1 Dynamics in Vivo: Virion Clearance Rate, Infected Cell Life-Span, and Viral Generation Time. *Science*, 271(5255), 1582-1586.

Perko, S., 2001, *Differential Equations and Dynamical Systems : 3rd Edition*. Texts in Applied Mathematics Vol. 7, Springer Verlag , New York , USA.

Roman, Steven,2007, Advanced Linear Algebra. 3rd ed. Springer Science & Business Media.

Rong, L., Gilchrist, M.A., Feng, Z.,& Perelson, A. S.(2007).Modeling within-host hiv-1 dynamics and the evolution of drug resistance: Trade-offs between viral enzyme function and drug susceptibility.*Journal of Theoretical Biology*, 247(4), 804-818.

Royden, H., dan Fitzpatrick, P. M., 2010, Real analysis, China Machine Press.

Sastry, S., 1999, Nonlinear System : Analysis, Stability, and Control, Spriger-Verlag, New York.

Sigal, A., Kim, Jocelyn T., Balazs, Alejandro B., Dekel, E., Mayo, A., Milo, R., & Baltimore, D.(2011). Cell-to-cell spread of HIV permits ongoing replication despite antiretroviral therapy. *Nature* 477, 95-98.

Song, H., Jiang, W. & Liu, S. (2014). Virus dynamics model with intracellular delays and immune response. *Mathematical Biosciences and Engineering*, 12(1), 185-208.

UNIVERSITAS
GADJAH MADA
PEMODELAN MATEMATIKA INFEKSI HIV DENGAN INSIDENSI SATURASI DALAM PENULARAN SEL-KE-SEL DAN RESPONS IMUN SEL T CITOTOKSIK
Novida Butar Butar, Prof.Dr.Fajar Adi Kusumo, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Sun, L., Su, Y., Jiao, A., Wang, X. & Zhang, B. (2023). T cells in health and disease. *Signal Transduction and Targeted Therapy*, 8(1).

Sutimin, S., Sunarsih, S., & Tjahjana, R. H. (2018). Modeling CD4+ T cells and CTL response in HIV-1 infection with antiretroviral therapy. *Communication in Biomathematical Sciences*, 1(2), 100.

Sturdevant, C. B., Joseph, S. B., Schnell, G., Price, R. W., Swanstrom, R. & Spudich, S. (2015). Compartmentalized replication of r5 t cell-tropic hiv-1 in the central nervous system early in the course of infection.*PLOS Pathogens*, 11(3), e1004720.

Taylor, A. E. dan Mann, W.R., 1983, Advanced Calculus Third Edition, John Wiley and Son, New York.

UNAIDS. AIDS Epidemic Update. *Technical report*, 2024.

Verhulst, F.,1985, Nonlinear Diferential Equation and Dynamical Systems, Springer, New York.

Wang, Y., Zhou, Y., Brauer, F., & Heffernan, J. M. (2013). Viral dynamics model with CTL immune response incorporating antiretroviral therapy. *Journal Of Mathematical Biology*, 67(4), 901-934.

World Health Organization. *HIV/AIDS.key fact*,WHO, 2025.

Wiggins, S., 2003, *Introduction to Applied Nonlinear Dynamical Systems and Chaos*, Spirnger, USA.

Wilen, C. B., Tilton, J. C. & Doms, R. W. (2012). Hiv: Cell binding and entry. *Cold Spring Harbor Perspectives in Medicine*, 2(8), a006866-a006866.

Wiraya, A., Fitriana, L., Triyanto, , Adi, Y. A., Kusumadewi, Y. A. & Khoirunnisa, S. (2024). Bifurcation analysis of the dynamics in covid?19 transmission through living and nonliving media. *Journal of Applied Mathematics*, 2024(1).

UNIVERSITAS
GADJAH MADA
PEMODELAN MATEMATIKA INFEKSI HIV DENGAN INSIDENSI SATURASI DALAM PENULARAN SEL-KE-SEL DAN RESPONS IMUN SEL T CITOTOKSIK
Novida Butar Butar, Prof.Dr.Fajar Adi Kusumo, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Y. Yang and R. Xu.(2022). Mathematical analysis of a delayed HIV infection model with saturated CTL immune response and immune impairment.*Journal of Applied Mathematics and Computing*,68.