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DAFTAR PUSTAKA

Ambarita, L. P., Taviv, Y., Budiyanto, A., Sitorus, H., & Febriyanto. (2014). *Tingkat Kerentanan Aedes aegypti (Linn.) terhadap Malation di Provinsi Sumatera Selatan*.

Amelia-Yap, Z. H., Chen, C. D., Sofian-Azirun, M., & Low, V. L. (2018). Pyrethroid resistance in the dengue vector Aedes aegypti in Southeast Asia: Present situation and prospects for management. In *Parasites and Vectors* (Vol. 11, Issue 1). BioMed Central Ltd. https://doi.org/10.1186/s13071-018-2899-0

Amelia-Yap, Z. H., Sofian-Azirun, M., Chen, C. D., Suana, I. W., Edy, S., Razak, A., & Low, V. L. (2019). V1016G Point Mutation: The Key Mutation in the Voltage-Gated Sodium Channel (Vgsc) Gene of Pyrethroid-Resistant Aedes aegypti (Diptera: Culicidae) in Indonesia. *J Med Entomol*, *4*(56), 953–958.

Apriliani Setiawan, Q., & Irmawartini. (2023). *Tinjauan Pengolahan Limbah Cair Di Rumah Sakit Umum Daerah Majalaya Kabupaten Bandung*. *11*(4). https://doi.org/10.14710/jkm.v11i4.36618

Arianti, N. F., Budiharjo, A., & Sayono. (2023). Kerentanan Nyamuk Aedes aegypti dan Aedes albopictus Terhadap Cypermethrin Berdasarkan Ketinggian Daerah di Provinsi Jawa Tengah. *Prosiding Seminar Kesehatan Masyarakat*, *1*, 70–76.

Atencia-Pineda, M. C., García-Leal, J., Diaz-Ortiz, D., Pareja-Loaiza, P., Pacheco-Lugo, L., Hoyos-López, R., Calderón-Rangel, A., Fragozo-Castilla, P., Gutiérrez-Rodríguez, S. M., Flores, A. E., & Maestre-Serrano, R. (2025). Susceptibility to organophosphate insecticides in Aedes aegypti (Diptera: Culicidae) from northern Colombia and associated resistance mechanisms. *Parasites and Vectors* , *18*(1). https://doi.org/10.1186/s13071-024-06624-8

Bass, C., Puinean, A. M., Zimmer, C. T., Denholm, I., Field, L. M., Foster, S. P., Gutbrod, O., Nauen, R., Slater, R., & Williamson, M. S. (2014). The evolution of insecticide resistance in the peach potato aphid, Myzus persicae. In *Insect Biochemistry and Molecular Biology* (Vol. 51, Issue 1, pp. 41–51). Elsevier Ltd. https://doi.org/10.1016/j.ibmb.2014.05.003

BBLKL. (2024, August 9). *Upaya Pengendalian Vektor Demam Berdarah Dengue Melalui Pemanfaatan Lethal Ovitrap di Kabupaten Kulonprogo, DIY*.

Bingham, G., Strode, C., Tran, L., Khoa, P. T., & Jamet, H. P. (2011). Can piperonyl butoxide enhance the efficacy of pyrethroids against pyrethroid-resistant Aedes aegypti? *Tropical Medicine and International Health*, *16*(4), 492–500. https://doi.org/10.1111/j.1365-3156.2010.02717.x

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Botemma, C. D. K., & Sommer, S. S. (1993). PCR Amplification of Specific Alleles: Rapid Detection of Known Mutations and Polymorphisms. *Mutation Research/Fundamental and Molecular Mechanisms of Mutagenesis*, *288*(1), 93–102.

CDC. (2024a). *Global Manual for Evaluating Insecticide Resistance Using the CDC Bottle Bioassay 2 International Manual for Evaluating Insecticide Resistance Using the CDC Bottle Bioassay*. https://www.cdc.gov/parasites/education_training/lab/bottlebioassay.html

CDC. (2024b, April 16). *Life Cycle of Aedes Mosquitoes*. Https://Www.Cdc.Gov/Mosquitoes/about/Life-Cycle-of-Aedes-Mosquitoes.Html.

Chen, L., Zhou, K., Shi, J., Zheng, Y., Zhao, X., Du, Q., Lin, Y., Yin, X., Jiang, J., & Feng, X. (2024). Pyrethroid resistance status and co-occurrence of V1016G, F1534C and S989P mutations in the Aedes aegypti population from two dengue outbreak counties along the China-Myanmar border. *Parasites and Vectors*, *17*(1). https://doi.org/10.1186/s13071-024-06124-9

Chen, Y. H., Cohen, Z. P., Bueno, E. M., Christensen, B. M., & Schoville, S. D. (2023). Rapid evolution of insecticide resistance in the Colorado potato beetle, Leptinotarsa decemlineata. In *Current Opinion in Insect Science* (Vol. 55). Elsevier Inc. https://doi.org/10.1016/j.cois.2022.101000

Choirul Hidajat, M., Ambar Garjito, T., Prihasto Siswoko, S., Tunjungsari Dyah Ayuningtyas, R., Oktsari Yanti, A., Mirna Anggraeni, Y., Trapsilowati, W., & Hadisaputro, S. (2022). *Comparison Of The Who Standard And The CDC Bottle Bioassay Testing Methods For Assessing The Dengue Vectors' Susceptibility To Insecticides In Semarang, Indonesia* (Vol. 53).

Chung, H. H., Cheng, I. C., Chen, Y. C., Lin, C., Tomita, T., & Teng, H. J. (2018a). Voltage-gated sodium channel intron polymorphism and four mutations comprise six haplotypes in an Aedes aegypti population in Taiwan. *PLoS Neglected Tropical Diseases*, *13*(3). https://doi.org/10.1371/journal.pntd.0007291

Chung, H. H., Cheng, I. C., Chen, Y. C., Lin, C., Tomita, T., & Teng, H. J. (2018b). Voltage-gated sodium channel intron polymorphism and four mutations comprise six haplotypes in an Aedes aegypti population in Taiwan. *PLoS Neglected Tropical Diseases*, *13*(3). https://doi.org/10.1371/journal.pntd.0007291

Chusniasih, D., & Tutik. (2019). The Mosquito Repellent Potential Of Cocoa Peel Gel Extract (Theobroma caco L.) Againts Aedes Aegypti L. *Jurnal Analisi Farmasi*, *4*, 84–90.

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Dafalla, O., Alsheikh, A., Mohammed, W., Shrwani, K., Alsheikh, F., Hobani, Y., & Noureldin, E. (2019). Knockdown resistance mutations contributing to pyrethroid resistance in Aedes aegypti population, Saudi Arabia. *Eastern Mediterranean Health Journal*, *25*(12), 905–913. https://doi.org/10.26719/emhj.19.081

De Almeida, L. G., De Moraes, L. A. B., Trigo, J. R., Omoto, C., & Cônsoli, F. L. (2017). The gut microbiota of insecticide-resistant insects houses insecticide-degrading bacteria: A potential source for biotechnological exploitation. *PLoS ONE*, *12*(3). https://doi.org/10.1371/journal.pone.0174754

Dinas Kesehatan Provinsi Sumatera Selatan. (2024). *Analisis Situasi Terkini Program Dengue dan Arbovirus Lainnya di Prov. Sumsel (per 12 Juni 2024)*.

Ditjenbun Kementan. (2024, August 10). *Pengaruh Insektisida Golongan Piretroid Terhadap Kebugaran Helopeltis Antonii*. Https://Ditjenbun.Pertanian.Go.Id/Pengaruh-Insektisida-Golongan-Piretroid-Terhadap-Kebugaran-Helopeltis-Antonii/.

Du, Y., Nomura, Y., Zhorov, B. S., & Dong, K. (2016). Sodium channel mutations and pyrethroid resistance in Aedes aegypti. In *Insects* (Vol. 7, Issue 4). MDPI AG. https://doi.org/10.3390/insects7040060

Egid, B. R., Coulibaly, M., Dadzie, S. K., Kamgang, B., McCall, P. J., Sedda, L., Toe, K. H., & Wilson, A. L. (2022). Review of the ecology and behaviour of Aedes aegypti and Aedes albopictus in Western Africa and implications for vector control. In *Current Research in Parasitology and Vector-Borne Diseases* (Vol. 2). Elsevier B.V. https://doi.org/10.1016/j.crpvbd.2021.100074

EPA Goverment. (2024, August 10). *Permethrin, Resmethrin, d-Phenothrin (Sumithrin®): Synthetic Pyrethroids For Mosquito Control*. Https://Www.Epa.Gov/Mosquitocontrol/Permethrin-Resmethrin-d-Phenothrin-Sumithrinr-Synthetic-Pyrethroids-Mosquito.

Farnesi, L. C., Menna-Barreto, R. F. S., Martins, A. J., Valle, D., & Rezende, G. L. (2015). Physical features and chitin content of eggs from the mosquito vectors Aedes aegypti, Anopheles aquasalis and Culex quinquefasciatus: Connection with distinct levels of resistance to desiccation. *Journal of Insect Physiology*, *83*, 43–52. https://doi.org/10.1016/j.jinsphys.2015.10.006

Field, L. M., Emyr Davies, T. G., O'Reilly, A. O., Williamson, M. S., & Wallace, B. A. (2017). Voltage-gated sodium channels as targets for pyrethroid insecticides. *European Biophysics Journal*, *46*(7), 675–679. https://doi.org/10.1007/s00249-016-1195-1

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Fitriana, L. (2019). *Deteksi Resisten Aedes aegypti Terhadap Sipermetrin Menggunakan Teknik Polymerase Chain Reaction (PCR) di Ambarawa Kabupaten Semarang Tahun 2019*.

Focks, D. A. (2004). *A Review Of Entomological Sampling Methods and Indicators For Dengue Vectors*. www.inis.ie

Food and Environmental Hygiene Department. (2025, July 6). *Food and Environmental Hygiene Department*. Https://Www.Fehd.Gov.Hk/English/Pestcontrol/Dengue_fever/Index.Html#.

Garjito, T. A., Hidajat, M. C., Kinansi, R. R., Setyaningsih, R., Anggraeni, Y. M., Mujiyanto, Trapsilowati, W., Jastal, Ristiyanto, Satoto, T. B. T., Gavotte, L., Manguin, S., & Frutos, R. (2020). Stegomyia Indices and Risk of Dengue Transmission: A Lack of Correlation. *Frontiers in Public Health*, *8*. https://doi.org/10.3389/fpubh.2020.00328

Ghiffari, A., Fatimi, ∗ Humairo, & Anwar, C. (2013). *Deteksi Resistensi Insektisida Sintetik Piretroid Pada Aedes aegypti (L.) Strain Palembang Menggunakan Teknik Polymerase Chain Reaction* (Vol. 5, Issue 2).

Habboush, Y., & Guzman, N. (2023). Funtion. In O. P. M. Center (Ed.), *Antibiotic Resistance*. StatPearls Publishing.

Handayani, D., Manda Putra, R., & Kantor Kesehatan Pelabuhan Kelas Pekanbaru, P. I. (2021). Uji resistensi nyamuk aedes aegypti terhadap sipermetrin 0,05% dipelabuhan Sungai Duku dan Bandara Sultan Syarif Kasim II Pekanbaru. *Jurnal Kesehatan*, *1*(1), 16–21. http://sehati.pelantarpress.co.id/|16

Handayani, M. T., Raharjo, M., & Joko, T. (2023a). Pengaruh Indeks Entomologi dan Sebaran Kasus Demam Berdarah Dengue di Kabupaten Sukoharjo. *Jurnal Kesehatan Lingkungan Indonesia*, *22*(1), 46–54. https://doi.org/10.14710/jkli.22.1.46-54

Handayani, M. T., Raharjo, M., & Joko, T. (2023b). Pengaruh Indeks Entomologi dan Sebaran Kasus Demam Berdarah Dengue di Kabupaten Sukoharjo. *Jurnal Kesehatan Lingkungan Indonesia*, *22*(1), 46–54. https://doi.org/10.14710/jkli.22.1.46-54

Haryanto, D., Dalilah, D., Anwar, C., Prasasti, G. D., Handayani, D., & Ghiffari, A. (2019). Investigasi resistensi Anopheles sp. terhadap insektisida piretroid dan kemungkinan terjadinya mutasi gen voltage gated sodium channel (VGSC). *Jurnal Entomologi Indonesia*, *15*(3), 134. https://doi.org/10.5994/jei.15.3.134

Hestiningsih, R., Ginandjar, P., Peminatan Epidemiologi, M., Kesehatan Masyarakat, F., Diponegoro, U., & Epidemiologi, B. (2020). *Status*

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
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Kerentanan Nyamuk Aedes aegypti Terhadap Insektisida Sipermetrin Di Pelabuhan Tanjung Balai Karimun Provinsi Kepulauan Riau. *8*(6). http://ejournal3.undip.ac.id/index.php/jkm

Hidayahtullah, F. S., Anwar, C., & Handayani, D. D. (2020). *Mutasi Titik F1534C Gen Voltage Gated Sodium Channel (VGSC) Pada Aedes aegypti di Kelurahan Pancur Pungah*.

Hidayati, L., Hadi, U. K., & Soviana, S. (2018a). Pemanfaatan ovitrap dalam pengukuran populasi Aedes sp. dan penentuan kondisi rumah. *Jurnal Entomologi Indonesia*, *14*(3), 126. https://doi.org/10.5994/jei.14.3.126

Hidayati, L., Hadi, U. K., & Soviana, S. (2018b). Pemanfaatan ovitrap dalam pengukuran populasi Aedes sp. dan penentuan kondisi rumah. *Jurnal Entomologi Indonesia*, *14*(3), 126. https://doi.org/10.5994/jei.14.3.126

Hirata, K., Komagata, O., Itokawa, K., Yamamoto, A., Tomita, T., & Kasai, S. (2014). A Single Crossing-Over Event in Voltage-Sensitive Na+ Channel Genes May Cause Critical Failure of Dengue Mosquito Control by Insecticides. *PLoS Neglected Tropical Diseases*, *8*(8). https://doi.org/10.1371/journal.pntd.0003085

Hisyam, M., Adelia, A. W., Afifa, A. R., Dewi, E. P., Qurrota, L. A., Zulfikar, M. F., Yustisari, P., Repti, P. F., Vianda Wivana, R. B., Aminatul, S. S., & Dian Setiawan, C. (2020). Pengetahuan Dan Pola Penggunaan Insektisida Antinyamuk Oleh Ibu Rumah Tangga Di Kelurahan Mojo Surabaya. In *Jurnal Farmasi Komunitas* (Vol. 6, Issue 2).

IML. (2024). *IML Testing & Research*. Https://Www.Imlresearch.Com/Uji-Efikasi/.

Irawati, N. B. U. (2019). *Deteksi Mutasi Gen Voltage-Gated Sodium Channel Nyamuk Aedes aegypti Terhadap Insektisida SIpermetrin di Kecamatan Ceper Kabupaten Klaten*.

Ishartadiati, K. (2022). *Resistensi Serangga Terhadap DDT*.

Ishida, C., Zubair, M., & Gupta, V. (2024). *Molecular Genetics Testing*. StatPearls Publishing.

Islami, S., Wibowo, H., Syafruddin, D., Kurniawan, A., Sadikin, M., & Suryandari, D. A. (2017). *Peran gen VGSC pada resistensi aedes aegypti l. terhadap insektisida piretroid permetrin di Palembang dan Jakarta*.

ITIS. (2024, May 17). *Integrated Taxonomic Information System - Report*. Https://Www.Itis.Gov/Servlet/SingleRpt/SingleRpt?Search_topic=TSN&search_value=126240#null.

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Jaffar, S., Ahmad, S., & Lu, Y. (2022). Contribution of insect gut microbiota and their associated enzymes in insect physiology and biodegradation of pesticides. In *Frontiers in Microbiology* (Vol. 13). Frontiers Media S.A. https://doi.org/10.3389/fmicb.2022.979383

Joharina, A. S., & Alfiah, S. (2011). Analisis Deskriptif Insektisida Rumah Tangga Yang Beredar di Masyarakat. *Jurnal Vektora*, *IV*.

Kamgang, B., Happi, J. Y., Boisier, P., Njiokou, F., Hervé, J. P., Simard, F., & Paupy, C. (2010). Geographic and ecological distribution of the dengue and chikungunya virus vectors Aedes aegypti and Aedes albopictus in three major Cameroonian towns. *Medical and Veterinary Entomology*, *24*(2), 132–141. https://doi.org/10.1111/j.1365-2915.2010.00869.x

Kasai, S., Komagata, O., Itokawa, K., Shono, T., Ng, L. C., Kobayashi, M., & Tomita, T. (2014a). Mechanisms of Pyrethroid Resistance in the Dengue Mosquito Vector, Aedes aegypti: Target Site Insensitivity, Penetration, and Metabolism. *PLoS Neglected Tropical Diseases*, *8*(6). https://doi.org/10.1371/journal.pntd.0002948

Kasai, S., Komagata, O., Itokawa, K., Shono, T., Ng, L. C., Kobayashi, M., & Tomita, T. (2014b). Mechanisms of Pyrethroid Resistance in the Dengue Mosquito Vector, Aedes aegypti: Target Site Insensitivity, Penetration, and Metabolism. *PLoS Neglected Tropical Diseases*, *8*(6). https://doi.org/10.1371/journal.pntd.0002948

Kementrian Kesehatan RI. (2012). *Pedoman Penggunaan Insektisida (Pestisida)*. Kementrian Kesehatan RI.

Kementrian Kesehatan RI. (2024a). *Ketika Demam Berdarah Kembali Merebak*. Https://Sehatnegeriku.Kemkes.Go.Id/Baca/Blog/20240605/0545670/Ketika-Demam-Berdarah-Kembali-Merebak/.

Kementrian Kesehatan RI. (2024b). *Pedoman Surveilans dan Pengendalian Vektor dan Binatang Pembawa Penyakit di Pintu Masuk*. Kementrian Kesehatan RI.

Kementrian Kesehatan RI. (2024c). *Profil Kesehatan Indonesia 2023*.

Kementrian Pertanian RI. (1973). *Peraturan Pemerintah No. 7 Tahun 1973 tentang Pengawasan Atas Peredaran, Penyimpanan dan Penggunaan Pestisida*.

Kementrian Pertanian RI. (2013). Pengelompokkan Pestisida Berdasarkan Cara Kerja (Mode of Action). In Prabaningrum, T. K. Moekasan, & Laksminiwati (Eds.), *Cara Kerja Insektisida, Fungisida, dan Herbisida*. Balai Pertanian Tanaman Sayuran.

Kurnia, R., Diansafitri, M., & Hanum, U. (2022a). Risiko Penularan DBD Berdasarkan Maya Index di Kelurahan Batu 9 Kecamatan Tanjungpinang

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Timur Kota Tanjungpinang. *Jurnal Ilmu Kesehatan)*, *6*(1). https://doi.org/10.33757/jik.v6i1.490.g214

Kurnia, R., Diansafitri, M., & Hanum, U. (2022b). Risiko Penularan DBD Berdasarkan Maya Index di Kelurahan Batu 9 Kecamatan Tanjungpinang Timur Kota Tanjungpinang. *Jurnal Ilmu Kesehatan)*, *6*(1). https://doi.org/10.33757/jik.v6i1.490.g214

Lima, J. B. P., Da-Cunha, M. P., Da-Silva, R. C. J., Galardo, A. K. R., Soares, S. da S., Braga, I. A., Ramos, R. P., & Valle, D. (2003). Resistance of Aedes aegypti to organophosphates in several municipalities in the State of Rio de Janeiro and Espírito Santo, Brazil. *Am J Trop Med Hyg*.

Margus, A. V, Yuliawati, S., & Hestiningsih, R. (2021). *Aplikasi Penggunaan Insektisida Rumah Tangga di Area Buffer Wilayah Kerja Kantor Kesehatan Pelabuhan Kelas III Sampit*. *11*(1), 5–20. https://ejournal.undip.ac.id/index.php/jim/index

Mashlawi, A. M., Al-Nazawi, A. M., Noureldin, E. M., Alqahtani, H., Mahyoub, J. A., Saingamsook, J., Debboun, M., Kaddumukasa, M., Al-Mekhlafi, H. M., & Walton, C. (2022a). Molecular analysis of knockdown resistance (kdr) mutations in the voltage-gated sodium channel gene of Aedes aegypti populations from Saudi Arabia. *Parasites and Vectors*, *15*(1). https://doi.org/10.1186/s13071-022-05525-y

Mashlawi, A. M., Al-Nazawi, A. M., Noureldin, E. M., Alqahtani, H., Mahyoub, J. A., Saingamsook, J., Debboun, M., Kaddumukasa, M., Al-Mekhlafi, H. M., & Walton, C. (2022b). Molecular analysis of knockdown resistance (kdr) mutations in the voltage-gated sodium channel gene of Aedes aegypti populations from Saudi Arabia. *Parasites and Vectors*, *15*(1). https://doi.org/10.1186/s13071-022-05525-y

Müller, G. C., Tsabari, O., Traore, M. M., Traore, S. F., Doumbia, S., Kravchenko, V. D., Junnila, A., & Beier, J. C. (2016). First record of Aedes albopictus in inland Africa along the River Niger in Bamako and Mopti, Mali. *Acta Tropica*, *162*, 245–247. https://doi.org/10.1016/j.actatropica.2016.07.008

Mulyaningsih, B., Umniyati, S. R., Satoto, T. B. T., Diptyanusa, A., Nugrahaningsih, D. A. A., & Selian, Y. (2018). Insecticide resistance and mechanisms of Aedes aegypti (Diptera: Culicidae) in Yogyakarta. *Journal of Thee Medical Sciences (Berkala Ilmu Kedokteran)*, *50*(01), 24–32. https://doi.org/10.19106/jmedsci005001201803

Mundim-Pombo, A. P. M., Carvalho, H. J. C. de, Rodrigues Ribeiro, R., León, M., Maria, D. A., & Miglino, M. A. (2021). Aedes aegypti: egg morphology and

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

embryonic development. *Parasites and Vectors*, *14*(1). https://doi.org/10.1186/s13071-021-05024-6

National Center for Biotechnology Information. (2024, August 10). *PubChem Compound Summary for CID 12617362, Zeta-cypermethrin.* Https://Pubchem.Ncbi.Nlm.Nih.Gov/Compound/Zeta-Cypermethrin.

Ninditya, V. I. (2019). *Status Sensitivitas Aedes aegypti dari Sumatera Selatan Terhadap Beberapa Insektisida dan Pengaruh Mutasi Titik V101G Gen Voltage Gated Sodium Channels (VGSC) Terhadap Resistensi Permethrin*.

Nizhamiya, A. D. (2022). *Deteksi Mutasi V1016GPada Gen VGSC Pada Populasi Aedes aegypti Yang Resisten Terhadap Insektisida Sipermetrin di Kedungmundu, Semarang*.

Nussbaum, R. L., McInnes, R. R., Willadr, H. F., & Hamosh A. (2016). *Thompson & Thompson Genetics in Medicine (Ed. 8)*. Elsevier.

OECD. (2018). *Harmonisation of Regulatory Oversight in Biotechnology Safety Assessment of Transgenic Organisms in the Environment, Volume 8*.

Oessoe, Y. Y. E. (2019). Identifikasi dan Penentuan Kadar Residu Insektisida Pada Kubis dan Tomat di Modoinding dan Rurukan. *Eugenia*, *25*(1), 33–38.

Pahlevi, B. F. M., & Kesetyaningsih, T. W. (2019). Proporsi Larva Aedes aegypti dan Aedes albopictus, Hubungannya dengan Kejadian Demam Berdarah Dengue di Daerah Endemik Suburban Kabupaten Sleman, Yogyakarta. *BALABA: JURNAL LITBANG PENGENDALIAN PENYAKIT BERSUMBER BINATANG BANJARNEGARA*, 163–170. https://doi.org/10.22435/blb.v15i2.1800

Palomino, M., Pinto, J., Yañez, P., Cornelio, A., Dias, L., Amorim, Q., Martins, A. J., Lenhart, A., & Lima, J. B. P. (2022). First national-scale evaluation of temephos resistance in Aedes aegypti in Peru. *Parasites and Vectors*, *15*(1). https://doi.org/10.1186/s13071-022-05310-x

Parker, C. (2020). Collection and rearing of container mosquitoes and a 24-h addition to the CDC bottle bioassay. *Journal of Insect Science*, *20*(6). https://doi.org/10.1093/jisesa/ieaa059

Pilego, E. P., Jorge, V., & Collar, A. F. (2017). Seasonality on the life cycle of Aedes aegypti mosquito and its statistical relation with dengue outbreaks. *Applied Mathematical Modelling*, *13*, 484–489.

Pliego Pliego, E., Velázquez-Castro, J., & Fraguela Collar, A. (2017). Seasonality on the life cycle of Aedes aegypti mosquito and its statistical relation with dengue outbreaks. *Applied Mathematical Modelling*, *50*, 484–496. https://doi.org/10.1016/j.apm.2017.06.003

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Prasetyowati, H., & Ginanjar, A. (2017). *Maya Indeks Dan Kepadatan Larva aedes Aegypti Di Daerah Endemis DBD Jakarta Timur*.

Pu, J., & Chung, H. (2024). New and emerging mechanisms of insecticide resistance. In *Current Opinion in Insect Science* (Vol. 63). Elsevier Inc. https://doi.org/10.1016/j.cois.2024.101184

Purba, I. G., Sunarsih, E., Septiawati, D., Sitorus, R. J., & Lionita, W. (2020). Keluhan Kesehatan Subjektif Pada Masyarakat Pengguna Insektisida Antinyamuk di Kecamatan Indralaya. *Jurnal Kesehatan Lingkungan Indonesia*, *19*(1), 35. https://doi.org/10.14710/jkli.19.1.35-44

Purnama, S. G., & Baskoro, T. (2012). Maya Index dan Kepadatan Larva Aedes aegypti Terhadap Infeksi Dengue. In *DESEMBER* (Vol. 16, Issue 2).

Purwaningsih, Rahmah Umniyati, S., & Mulyaningsih, B. (2019). Combined Target Site Vgsc Mutations Play A Primary Role In Pyrethroid Resistant Phenotypes Of Aedes Aegypti As Dengue Vector From Palu City, Central Sulawesi. In *Indonesian Journal of Tropical and Infectious Disease* (Vol. 7, Issue 5).

Rahayu, D. F., & Ustiawan, A. (2013). *Identifikasi Aedes aegypyi dan Aedes albopictus* (Vol. 9, Issue 01). www.childrenfamily.com.

Ramadhani, M. M., & Astuty, H. (2013). *Kepadatan dan Penyebaran Aedes aegypti Setelah Penyuluhan DBD di Kelurahan Paseban, Jakarta Pusat Aedes aegypti Population Density and Distribution after Health Education in Paseban Village, Central Jakarta*.

Rauf, A. (1999). Persepsi dan Tindakan Petani Kentang Terhadap Lalat Pengorok Daun, Liriomyza huidobrensis (Blanchard) (Diptera: Agromyzidae). *Buletin Hama Dan Penyakit Tumbuhan*.

Reinhold, J. M., Lazzari, C. R., & Lahondère, C. (2018). Effects of the environmental temperature on Aedes aegypti and Aedes albopictus mosquitoes: A review. In *Insects* (Vol. 9, Issue 4). MDPI AG. https://doi.org/10.3390/insects9040158

Ridha, M. R., Marlinae, L., Zubaidah, T., Fadillah, N. A., Widjaja, J., Rosadi, D., Rahayu, N., Ningsih, M., Desimal, I., & Sofyandi, A. (2023). Control methods for invasive mosquitoes of Aedes aegypti and Aedes albopictus (Diptera: Culicidae) in Indonesia. In *Veterinary World* (Vol. 16, Issue 9, pp. 1952–1963). Veterinary World. https://doi.org/10.14202/vetworld.2023.1952-1963

Ridha, M. R., Yudhastuti, R., Notobroto, H. B., Hidajat, M. C., Diyanah, K. C., Jassey, B., & Rahmah, G. M. (2025). A systematic review of insecticide resistance in Aedes aegypti (Diptera: Culicidae) and implications for dengue

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

control in Indonesia. In *Veterinary World* (Vol. 18, Issue 3, pp. 658–672). Veterinary World. https://doi.org/10.14202/vetworld.2025.658-672

Ruliansyah, A., Yuliasih, Y., & Hasbullah, S. (2014). Pemanfaatan citra ASTER dalam penentuan dan verifikasi daerah rawan Demam Berdarah Dengue (DBD) di Kota Banjar Provinsi Jawa Barat Utilization of ASTER image in the determination and verification Dengue Hemorrhagic Fever (DHF) prone areas in Banjar city, West Java. In *ASPIRATOR* (Vol. 6, Issue 2).

Ruliansyah, A., Yuliasih, Y., Ridwan, W., Jajang Kusnandar, A., Litbang Pengendalian Penyakit Bersumber Binatang, L. P., Penelitian dan Pengembangan Kesehatan, B., Kesehatan Republik Indonesia, K., Raya Pangandaran Km, J., Babakan Kp Kamurang, D., & Barat, J. (2017). Analisis Spasial Sebaran Demam Berdarah Dengue di Kota Tasikmalaya Tahun 2011 – 2015. In *ASPIRATOR* (Vol. 9, Issue 2).

Sanchez, L., Vanlerberghe, V., Alfonso, L., Marquetti, M. del C., Guzman, M. G., Bisset, J., & Stuyft, P. van der. (2006). *Aedes aegypti Larval Indices and Risk for Dengue Epidemics*. www.cdc.gov/eid

Satoto, T. B. T., Pascawati, N. A., Wibawa, T., Frutos, R., Maguin, S., Mulyawan, I. K., & Wardana, A. (2020). Entomological index and home environment contribution todengue hemorrhagic fever in Mataram City, Indonesia. *Kesmas*, *15*(1), 32–39. https://doi.org/10.21109/kesmas.v15i1.3294

Satoto, T. B. T., Satrisno, H., Lazuardi, L., Diptyanusa, A., Purwaningsih, Rumbiwati, & Kuswati. (2019). Insecticide resistance in Aedes aegypti: An impact from human urbanization? *PLoS ONE*, *14*(6). https://doi.org/10.1371/journal.pone.0218079

Siddiqui, J. A., Fan, R., Naz, H., Bamisile, B. S., Hafeez, M., Ghani, M. I., Wei, Y., Xu, Y., & Chen, X. (2023). Insights into insecticide-resistance mechanisms in invasive species: Challenges and control strategies. In *Frontiers in Physiology* (Vol. 13). Frontiers Media S.A. https://doi.org/10.3389/fphys.2022.1112278

Silalahi, C. N., Tu, W. C., Chang, N. T., Singham, G. V., Ahmad, I., & Neoh, K. B. (2022). Insecticide Resistance Profiles and Synergism of Field Aedes aegypti from Indonesia. *PLoS Neglected Tropical Diseases*, *16*(6). https://doi.org/10.1371/JOURNAL.PNTD.0010501

Sitorus, H., & Ambarita, L. P. (2004). Pengamatan Larva Aedes di Desa Sukaraya Kabupaten OKU dan Di Dusun Martapura Kabupaten OKU Timur Tahun 2004. *Media Litbang Kesehatan*, *XVII*.

Soraya, S., Anggraeni, Y., & Setiawati, H. (2023). Pengukuran Indeks Ovitrap Terhadap Populasi Telur Aedes sp. *JURNAL RISET KESEHATAN*

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

POLTEKKES DEPKES BANDUNG, *15*(2), 567–574. https://doi.org/10.34011/juriskesbdg.v15i2.1933

Souza, R. L., Nazare, R. J., Argibay, H. D., Pellizzaro, M., Anjos, R. O., Portilho, M. M., Jacob-Nascimento, L. C., Reis, M. G., Kitron, U. D., & Ribeiro, G. S. (2023). Density of Aedes aegypti (Diptera: Culicidae) in a low-income Brazilian urban community where dengue, Zika, and chikungunya viruses co-circulate. *Parasites and Vectors*, *16*(1). https://doi.org/10.1186/s13071-023-05766-5

Stenhouse, S. A., Plernsub, S., Yanola, J., Lumjuan, N., Dantrakool, A., Choochote, W., & Somboon, P. (2013a). Detection of the V1016G mutation in the voltage-gated sodium channel gene of Aedes aegypti (Diptera: Culicidae) by allele-specific PCR assay, and its distribution and effect on deltamethrin resistance in Thailand. *Parasites and Vectors*, *6*(1). https://doi.org/10.1186/1756-3305-6-253

Stenhouse, S. A., Plernsub, S., Yanola, J., Lumjuan, N., Dantrakool, A., Choochote, W., & Somboon, P. (2013b). Detection of the V1016G mutation in the voltage-gated sodium channel gene of Aedes aegypti (Diptera: Culicidae) by allele-specific PCR assay, and its distribution and effect on deltamethrin resistance in Thailand. *Parasites and Vectors*, *6*(1). https://doi.org/10.1186/1756-3305-6-253

Sudiharto, M., Udiyono, A., & Kusariana, N. (2020). *Status Resistensi Aedes aegypti Terhadap Malathion 0,8% dan Sipermetrin 0,05% Di Pelabuhan Pulau Baai Kota Bengkulu*. *8*(2). http://ejournal3.undip.ac.id/index.php/jkm

Sujarwati, A., & Nurcandra, F. (2023). Pajanan Pestisida terhadap Dermatitis pada Petani Perkebunan di Kota Depok Organophosphate Pesticides Exposure to Dermatitis in Fruit Farmers in Depok City. In *JIKM* (Vol. 15, Issue 3).

Sukaningtyas, R., Udijono, A., Martini, M., Hestiningsih, R., Peminatan, M., Kesehatan, E., & Masyarakat, K. (2020). *Praktik Penggunaan Insektisida Rumah Tangga Di Area Buffer Pelabuhan Tanjung Emas Wilayah Kerja Kantor Kesehatan Pelabuhan Kelas II Semarang*. *8*(6). http://ejournal3.undip.ac.id/index.php/jkm

Sukhumsirichart, W. (2018). Polymorphisms. In *Genetic Diversity and Disease Susceptibility*. InTech. https://doi.org/10.5772/intechopen.76728

Susanti, L., & Boesri, H. (2012). Insektisida Sipermethrin 100g/L Terhadap Nyamuk Dengan Metode Pengasapan. In *KEMAS* (Vol. 7, Issue 2). http://journal.unnes.ac.id/index.php/kemas

Tantowijoyo, W., Tanamas, S. K., Nurhayati, I., Setyawan, S., Budiwati, N., Fitriana, I., Ernesia, I., Wardana, D. S., Supriyati, E., Arguni, E., Meitika, Y.,

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Prabowo, E., Andari, B., Green, B. R., Hodgson, L., Rancès, E., Ryan, P. A., O'neill, S. L., Anders, K. L., … Simmons, C. P. (2022). Aedes aegypti abundance and insecticide resistance profiles in the Applying Wolbachia to Eliminate Dengue trial. *PLoS Neglected Tropical Diseases*, *16*(4). https://doi.org/10.1371/journal.pntd.0010284

Tikar, S., Kumar, A., & Prasad, G. B. K. S. (2009). Temephos-induced resistance in Aedes aegypti. *Parasitology Research*, *105*(9), 57–63.

Toxicol, A. (2011). Molecular Mechanisms of Pyrethroid Insecticide Neurotoxicity: Recent Advances. *Author Manuscript*, *86*(1), 165–181.

Trapsilowati, W., Pujiyanti, A., & Irawan, A. S. (2011). *Pengembangan Model Pengendalian Vektor Demam Berdarah*.

Triwahyuni, T., Maria Puji Lestari, S., & Febriani Putri, D. (2020). The Effect of Transvenereal Transmission of Dengue Serotype-3 Virus on The Viability of Aedes Aegypti Eggs Based on Variation of Storage Time. In *Biospecies* (Vol. 13, Issue 2).

Ugozzoli, L., & Wallace, R. B. (1991). *Allele-specific Polymerase Chain Reaction*. Department of Molecular Biochemistry, Beckman Research Institute of the City of Hope.

WatmanlussyJacinta, G., Roberth Akollo, I., Talarima, B., Yanri Lameky, F., Pattipeluhu, L., Studi Kesehata Masyarakat, P., Kesehatan, F., Kristen Indonesia Maluku, U., Ambon, K., & Studi Keperawatan, P. (2024). Preferensi Tempat Perindukan Nyamuk Aedes spp. Pada Jenis dan Letak Kontainer di Wilayah Kerja Puskesmas Lateri, Kota Ambon Preferences for breeding places for Aedes spp. mosquitoes on materials and location of containers in the working area of Lateri Health Center, Ambon City. *Journal of Medical Laboratory in Infectious and Degenerative Diseases*, *1*(2).

Widiarti, Heriyanto, B., Tri Boewono, D., Widyastuti, U., Mujiono, Lasmiati, & Yuliadi. (2011). *Peta Resistensi Vektor Demam Berdarah Dengue Aedes aegypti Terhadap Insektisida Kelompok Organofosfat, Karbamat dan Pyrethroid di Propinsi Jawa Tengah dan Daerah Istimewa Yogyakarta* (Vol. 1).

Widiastuti, D., Pramestuti, N., Fiona Sari, T., Wijayanti, N., Penelitian dan Pengembangan Pengendalian Penyakit Bersumber Binatang Banjarnegara, B., Selamanik No, J., Banjarnegara, K., Tengah, J., & Besar Penelitian dan Pengembangan Vektor dan Reservoir Penyakit Salatiga, B. (n.d.). *Deteksi Mutasi V1016G Pada Gen Voltage-Gated Sodium Channel Pada Populasi Aedes aegypti (Diptera: Culicidae) Di Kabupaten Klaten, Jawa Tengah Dengan Metode Allele-Specific PCR*.

UNIVERSITAS GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

World Health Organization. (2009). *Dengue (Guidelines For Diagnosis, Treatment, Prevention and Control)*. www.who.int/tdr

World Health Organization. (2011). *Comprehensive Guidelines for Prevention and Control of Dengue and Dengue Haemorrhagic Fever*. World Health Organization Regional Office for South-East Asia.

World Health Organization. (2023). *WHO publishes recommendations on two new types of insecticide-treated nets.* Https://Www.Who.Int/News/Item/14-03-2023-Who-Publishes-Recommendations-on-Two-New-Types-of-Insecticide-Treated-Nets.

World Health Organization. (2024a). *Dengue - Global Situation*. Https://Www.Who.Int/Emergencies/Disease-Outbreak-News/Item/2024-DON518.

World Health Organization. (2024b). *Dengue and severe dengue*. Https://Www.Who.Int/News-Room/Fact-Sheets/Detail/Dengue-and-Severe-Dengue.

World Health Organization. (2024c). *Promoting dengue vector surveillance and control*. Https://Www.Who.Int/Activities/Promoting-Dengue-Vector-Surveillance-and-Control.

World Health Organization. (2024d). *WHO prequalifies new dengue vaccine*. Https://Www.Who.Int/News/Item/15-05-2024-Who-Prequalifies-New-Dengue-Vaccine.

Yunitra, C., Leri, A. P., Setyobudi, A., & Ndoen, E. M. (2021). Density Figure of Aedes Aegypti Larvae and Community Participation in Prevention of Dengue Hemorrhagic Fever (DHF). *Journal of Community Health*, *3*(3), 123. https://doi.org/10.35508/ljch

Zainul, R., Ansori, A. N. M., Murtadlo, A. A. A., Sucipto, T. H., Kharisma, V. D., Widyananda, M. H., Muchtaromah, B., Fadholly, A., Kusala, M. K. J., Jakhmola, V., Rebezov, M., Sahadewa, S., & Wiradana, P. A. (2024). The recent development of dengue vaccine: A review. In *Journal of Medicinal and Pharmaceutical Chemistry Research* (Vol. 6, Issue 4, pp. 362–382). Sami Publishing Company. https://doi.org/10.48309/jmpcr.2024.422416.1026

Zhou, G., Li, Y., Jeang, B., Wang, X., Cummings, R. F., Zhong, D., & Yan, G. (2022a). Emerging Mosquito Resistance to Piperonyl Butoxide-Synergized Pyrethroid Insecticide and Its Mechanism. *Journal of Medical Entomology*, *59*(2), 638–647. https://doi.org/10.1093/jme/tjab231

Zhou, G., Li, Y., Jeang, B., Wang, X., Cummings, R. F., Zhong, D., & Yan, G. (2022b). Emerging Mosquito Resistance to Piperonyl Butoxide-Synergized

UNIVERSITAS
GADJAH MADA
Investigasi Resistensi Aedes aegypti Terhadap Insektisida Zeta-cypermethrin dan Kemungkinan Terjadinya Mutasi Gen Voltage-Gated Sodium Channel (VGSC) di Desa Gumawang, Ogan Komering Ulu Timur
Lita Eliana, Prof. dr. Tri Baskoro Tunggul Satoto, M.Sc., Ph.D.; Dr. Muhammad Choirul Hidayat. S.K.M., M.Kes.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Pyrethroid Insecticide and Its Mechanism. *Journal of Medical Entomology*, *59*(2), 638–647. https://doi.org/10.1093/jme/tjab231

Zhu, F., Lavine, L., O'Neal, S., Lavine, M., Foss, C., & Walsh, D. (2016). Insecticide resistance and management strategies in urban ecosystems. In *Insects* (Vol. 7, Issue 1). MDPI AG. https://doi.org/10.3390/insects7010002