

REFERENCES

- Agrawal, N., P.V.N. Dasaradhi, A. Mohammed, P. Malhotra, R.K. Bhatnagar, and S.K. Mukherjee. 2003. RNA interference: Biology, mechanism, and applications. *Microbiol. Mol. Biol. Rev.* 67 (4): 657–685. <https://doi.org/10.1128/MMBR.67.4.657-685.2003>.
- Ali, M.W., W. Zheng, S. Sohail, Q. Li, W. Zheng, and H. Zhang. 2017. A genetically enhanced sterile insect technique against the fruit fly, *Bactrocera dorsalis* (Hendel) by feeding adults double-stranded RNAs. *Sci. Rep.* 7: 4063. <https://doi.org/10.1038/s41598-017-04431-z>.
- Ant, T., M. Koukidou, P. Rempoulakis, H.-F. Gong, A. Economopoulos, J. Vontas, and L. Alphey. 2012. Control of the olive fruit fly using genetics-enhanced sterile insect technique. *BMC Biol.* 10: 51. <https://www.biomedcentral.com/1741-7007/10/51>.
- Aravin, A.A., N.M. Naumova, A.V. Tulin, V.V. Vagin, Y.M. Rozovsky, and V.A.A. Gvozdev. 2001. Double-stranded RNA-mediated silencing of genomic tandem repeats and transposable elements in the *D. melanogaster* germline. *Curr. Biol.* 11 (13): 1017–1027. [https://doi.org/10.1016/S0960-9822\(01\)00299-8](https://doi.org/10.1016/S0960-9822(01)00299-8).
- Asgari, S. 2013. MicroRNA function in insects. *Insect Biochem. Mol. Biol.* 43: 388–397. <https://doi.org/10.1016/j.ibmb.2012.10.003>.
- Bartel, D.P. 2004. MicroRNAs: Genomics, biogenesis, mechanism, and function. *Cell* 116: 261–297. [https://doi.org/10.1016/S0092-8674\(04\)00045-5](https://doi.org/10.1016/S0092-8674(04)00045-5).
- Bartel, D.P. 2009. MicroRNAs: Target recognition and regulatory functions. *Cell* 136 (2): 215–233. <https://doi.org/10.1016/j.cell.2009.01.002>.
- Bartolomé, C., X. Bello, and X. Maside. 2009. Widespread evidence for horizontal transfer of transposable elements across *Drosophila* genomes. *Genome Biol.* 10: R22. <https://doi.org/10.1186/gb-2009-10-2-r22>.
- Baum, J.A., T. Bogaert, W. Clinton, G.R. Heck, P. Feldmann, O. Ilagan, S. Johnson, G. Plaetinck, T. Munyikwa, M. Pleau, T. Vaughn, and J. Roberts. 2007. Control of coleopteran insect pests through RNA interference. *Nat. Biotechnol.* 25: 1322–1326. <https://doi.org/10.1038/nbt1359>.
- Beck, C.W., and L.S. Blumer. 2021. Advancing undergraduate laboratory education using non-model insect species. *Annu. Rev. Entomol.* 66: 485–504. <https://doi.org/10.1146/annurev-ento-062920-095809>.

- Bellen, H.J., R.W. Levis, G. Liao, Y. He, J.W. Carlson, G. Tsang G., M. Evans-Holm, P.R. Hiesinger, K.L. Schulze, G.M. Rubin, and R.A. Hoskins. 2004. The BDGP gene disruption project: Single transposon insertions associated with 40% of *Drosophila* genes. *Genetics* 167 (2): 761–781. <https://doi.org/10.1534/genetics.104.026427>.
- Belles, X. 2017. MicroRNAs and the evolution of insect metamorphosis. *Annu. Rev. Entomol.* 62: 111–125. <https://doi.org/10.1146/annurev-ento-031616-034925>.
- Belles, X. 2020. Epigenetic-related mechanisms. *Insect metamorphosis*, pp. 177–197, in *From History to Regulation of Development and Evolution*. Academic Press, New York. <https://doi.org/10.1016/B978-0-12-813020-9.00008-9>.
- Bendena, W.G., J.H.L. Hui, I. Chin-Sang, and S.S. Tobe. 2020. Neuropeptide and microRNA regulators of juvenile hormone production. *Gen. Comp. Endocrinol.* 295: 113507. <https://doi.org/10.1016/j.ygcen.2020.113507>.
- Bishop, T.F., and A.L. Van Eenennaam. 2020. Genome editing approaches to augment livestock breeding programs. *J. Exp. Biol.* 223: jeb207159. <https://doi.org/10.1242/jeb.207159>.
- Bonning, B.C., and M.-C. Saleh. 2021. The interplay between viruses and RNAi pathways in insects. *Annu. Rev. Entomol.* 66: 61–79. <https://doi.org/10.1146/annurev-ento-033020-090410>.
- Brouns, S.J.J., M.M. Jore, M. Lundgren, E.R. Westra, R.J.H. Slijkhuis, A.P.L. Snijders, M.J. Dickman, K.S. Makarova, E.V. Koonin, and J. van der Oost. 2008. Small CRISPR RNAs guide antiviral defense in Prokaryotes. *Science* 321: 960–963. <https://doi.org/10.1126/science.1159689>.
- Burggren, W.W. 2017. Epigenetics in insects: Mechanisms, phenotypes and ecological and evolutionary implications. *Adv. Insect Physiol.* 53: 1–30. <https://doi.org/10.1016/bs.aiip.2017.04.001>.
- Camargo, C., K. Wu, E. Fishilevich, K.E. Narva, and B.D. Siegfried. 2018. Knockdown of RNA interference pathway genes in western corn rootworm, *Diabrotica virgifera virgifera*, identifies no fitness costs associated with Argonaute 2 or Dicer-2. *Pest. Biochem. Physiol.* 148: 103–110. <https://doi.org/10.1016/j.pestbp.2018.04.004>.
- Cao, M., J.A. Gatehouse, and E.C. Fitches. 2018. A systematic study of RNAi effects and dsRNA stability in *Tribolium castaneum* and *Acyrtosiphon pisum*, following injection and ingestion of analogous dsRNAs. *Int. J. Mol. Sci.* 19: 1079. <https://doi.org/10.3390/ijms19041079>.
- Cappelle, K., C.F.R. de Oliveira, B. Van Eynde, O. Christiaens, and G. Smagghe. 2016. The involvement of clathrin-mediated endocytosis and two Sid-1-like transmembrane proteins in double-stranded RNA uptake in the Colorado potato beetle midgut. *Insect Mol. Biol.* 25 (3): 315–323. <https://doi.org/10.1111/imb.12222>.
- Chalvet, F., L. Teyssset, C. Terzian, N. Prud'homme, P. Santamaria, A. Bucheton, and A. Pélisson. 1999. Proviral amplification of the Gypsy endogenous retrovirus of *Drosophila melanogaster* involves env-independent invasion of the female germline. *EMBO J.* 18 (9): 2659–2669. <https://doi.org/10.1093/emboj/18.9.2659>.
- Che, L.R., Z.-B. He, Y. Liu, Z.-T. Yan, B.Z. Han, X.-J. Chen, X.-F. He, J.-J. Zhang, B. Chen, and L. Qiao. 2021. Electroporation-mediated nucleic acid delivery during non-embryonic stages for gene-function analysis in *Anopheles sinensis*. *Insect Biochem. Mol. Biol.* 128: 103500. <https://doi.org/10.1016/j.ibmb.2020.103500>.
- Chen, E.-H. Chen, Y.-X. Tao, W. Song, F. Shen, M.-L. Yuan, P.-A. Tang, and E. Scully. 2020a. Transcriptome-wide identification of microRNAs and analysis of their potential roles in development of Indian meal moth (Lepidoptera: Pyralidae). *J. Econ. Entomol.* 113 (3): 1535–1546. <https://doi.org/10.1093/jee/toaa030>.
- Chen, J., T.C. Li, R. Pang, X.Z. Yue, J. Hu, and W.Q. Zhang. 2018. Genome-wide screening and functional analysis reveal that the specific microRNA nlu-miR-173 regulates molting by targeting *Ftz-F1* in *Nilaparvata lugens*. *Front. Physiol.* 9: 01854. <https://doi.org/10.3389/fphys.2018.01854>.
- Chen, W., Y. Dong, H.S.A. Saqib, L. Vasseur, W. Zhou, L. Zheng, Y. Lai, X. Ma, L. Lin, X. Xu, J. Bai, W. He, and M. You. 2020b. Functions of duplicated glucosinolate sulfatases in the development and host adaptation of *Plutella xylostella*. *Insect Biochem. Mol. Biol.* 119: 103316. <https://doi.org/10.1016/j.ibmb.2020.103316>.
- Cooper, A.M.W., K. Silver, J. Zhang, Y. Park, and K.Y. Zhu. 2019. Molecular mechanisms influencing efficiency of RNA interference in insects. *Pest. Manag. Sci.* 75 (1): 18–28. <https://doi.org/10.1002/ps.5126>.
- Cooper, A.M.W., H. Song, X. Shi, Z. Yu, M. Lorenzen, K. Silver, J. Zhang, and K.Y. Zhu. 2021. Characterization, expression patterns, and transcriptional responses of three core RNA interference pathway genes from *Ostrinia nubilalis*. *J. Insect Physiol.* 129: 104181. <https://doi.org/10.1016/j.jinsphys.2020.104181>.
- Cullen, B.R. 2014. Viruses and RNA interference: Issues and controversies. *J. Virol.* 88 (22): 12934–12936. <https://doi.org/10.1128/jvi.01179-14>.
- De Hayr, L., S. Asad, M. Hussain, and S. Asgari. 2020. RNA activation in insects: The targeted activation of endogenous and exogenous genes. *Insect Biochem. Mol. Biol.* 119: 103325. <https://doi.org/10.1016/j.ibmb.2020.103325>.
- Dhandapani, R.K., D. Gurusamy, J.L. Howrll, and S.R. Palli. 2019. Development of CS-TPP-dsRNA nanoparticles to enhance RNAi efficiency in the yellow fever mosquito, *Aedes aegypti*. *Sci. Rep.* 9: 8775. <https://doi.org/10.1038/s41598-019-45019-z>.
- Dietzl, G., D. Chen, F. Schnorrer, K.-C. Su, Y. Barinova, M. Fellner, B. Gasser, K. Kinsey, S. Oppel, S. Scheiblaue, A. Couto, V. Marra, K. Kkeleman, and B.J. Dickson. 2007. A genome-wide transgenic RNAi library for conditional gene inactivation in *Drosophila*. *Nature* 448: 151–156. <https://doi.org/10.1038/nature05954>.
- Doudna, J.A., and E. Charpentier. 2014. The new frontier of genome engineering with CRISPR-Cas9. *Science* 346 (6213): 1258096. <https://doi.org/10.1126/science.1258096>.
- Fire, A., S. Xu, M.K. Montgomery, S.A. Kostas, S.E. Driver, and C.C. Mello. 1998. Potent and specific genetic interference by double-stranded RNA in *Caenorhabditis elegans*. *Nature* 391: 806–811. <https://www.nature.com/articles/35888>.
- Gilbert, C., and C. Feschotte. 2018. Horizontal acquisition of transposable elements and viral sequences: Patterns and consequences. *Curr. Opin. Genet. Dev.* 49: 15–24. <https://doi.org/10.1016/j.gde.2018.02.007>.
- Gilbert, C., J. Peccoud, A. Chateigner, B. Moumen, R. Cordaux, and E.A. Herniou. 2016. Continuous influx of genetic material from host to virus populations. *PLoS Genet.* 12: e1005838. <https://doi.org/10.1371/journal.pgen.1005838>.
- Gilbert, C., J. Peccoud, and R. Cordaux. 2021. Transposable elements and the evolution of insects. *Annu. Rev. Entomol.* 66: 355–372. <https://doi.org/10.1146/annurev-ento-070720-074650>.

- Glastad, K.M., B.G. Hunt, and M.A.D. Goodisman. 2019. Epigenetics in insects: Genome regulation and the generation of phenotypic diversity. *Annu. Rev. Entomol.* 64 (1): 185–203. <https://doi.org/10.1146/annurev-ento-011118-111914>.
- Gloor, G.B., N.A. Nassif, D.M. Johnson-Schlitz, C.R. Preston, and W.R. Engels. 1991. Targeted gene replacement in *Drosophila* via P element-induced gap repair. *Science* 253 (5024): 1110–1117. <https://doi.org/10.1126/science.1653452>.
- Gui, S., C.N.T. Taning, D. Wei, and G. Smagghe. 2020. First report on CRISPR/Cas9-targeted mutagenesis in the Colorado potato beetle, *Leptinotarsa decemlineata*. *J. Insect Physiol.* 121: 104013. <https://doi.org/10.1016/j.jinsphys.2020.104013>.
- Guo, W.-C., K.-Y. Fu, S. Yang, X.-X. Li, and G.-Q. Li. 2015. Instar-dependent systemic RNA interference response in *Leptinotarsa decemlineata* larvae. *Pest. Biochem. Physiol.* 123: 64–73. <https://doi.org/10.1016/j.pestbp.2015.03.006>.
- Gurusamy, D., K. Mogilicherla, J.N. Shukla, and S.R. Palli. 2020a. Lipids help double-stranded RNA in endosomal escape and improve RNA interference in the fall armyworm, *Spodoptera frugiperda*. *Arch. Insect Biochem. Physiol.* 104: e21678. <https://doi.org/10.1002/arch.21678>.
- Gurusamy, D., K. Mogilicherla, and S.R. Palli. 2020b. Chitosan nanoparticles help double-stranded RNA escape from endosomes and improve RNA interference in the fall armyworm, *Spodoptera frugiperda*. *Arch. Insect Biochem. Physiol.* 104: e21677. <https://doi.org/10.1002/arch.21677>.
- Hapairai, L.K., K. Mysore, L. Sun, P. Li, C.-W. Wang, N.D. Scheel, A. Lesnik, M. P. Scheel, J. Igiede, N. Wei, D.W. Severson, and M. Duman-Scheel. 2020. Characterization of an adulticidal and larvicidal interfering RNA pesticide that targets a conserved sequence in mosquito G protein-coupled dopamine 1 receptor genes. *Insect Biochem. Mol. Biol.* 120: 103359. <https://doi.org/10.1016/j.ibmb.2020.103359>.
- Hay, B.A., G. Oberhofer, and M. Guo. 2021. Engineering the composition and fate of wild populations with gene drive. *Annu. Rev. Entomol.* 66: 407–434. <https://doi.org/10.1146/annurev-ento-020117-043154>.
- He, K., Y. Sun, H. Xiao, C. Ge, F. Li, and Z. Han. 2017. Multiple miRNAs jointly regulate the biosynthesis of ecdysteroid in the holometabolous insects, *Chilo suppressalis*. *RNA* 23 (12): 1817–1833. <https://doi.org/10.1261/rna.061408.117>.
- He, K., H. Xiao, Y. Sun, G. Situ, Y. Xi, and F. Li. 2019. microRNA-14 as an efficient suppressor to switch off ecdysone production after ecdysis in insects. *RNA Biol.* 16 (9): 1313–1325. <https://doi.org/10.1080/15476286.2019.1629768>.
- He, Q., Y. Zhang, and W. Dong. 2020. MicroRNA miR-927 targets the juvenile hormone primary response gene *Krüppel homolog1* to control *Drosophila* developmental growth. *Insect Mol. Biol.* 29: 6, 545–554. <https://doi.org/10.1111/imb.12662>.
- Ishino, Y., H. Shinagawa, K. Makino, M. Amemura, and A. Nakata. 1987. Nucleotide sequence of the *iap* gene, responsible for alkaline phosphatase isozyme conversion in *Escherichia coli*, and identification of the gene product. *J. Bacteriol.* 169 (12): 5429–5433.
- Jansen, R., and J.D.A. Embden, W. Gaastra, and L.M. Schouls. 2002a. Identification of genes that are associated with DNA repeats in prokaryotes. *Mol. Microbiol.* 43 (6): 1565–1575. <https://doi.org/10.1046/j.1365-2958.2002.02839.x>.
- Jansen, R., and J.D.A. Embden, W. Gaastra, and L.M. Schouls. 2002b. Identification of a novel family of sequence repeats among prokaryotes. *OMICS* 6 (1): 23–33. <https://doi.org/10.1089/15362310252780816>.
- Jayachandran, B. M. Hussain, and S. Agari. 2013. Regulation of *Helicoverpa armigera* ecdysone receptor by miR-14 and its potential link to baculovirus infection. *J. Invert. Path.* 114: 151–157. <https://doi.org/10.1016/j.jip.2013.07.004>.
- Jinek, M., K. Chylinski, I. Fonfara, M. Hauer, J.A. Doudna, and E. Charpentier. 2012. A programmable dual-RNA-guided DNA endonuclease in adaptive bacterial immunity. *Science* 337: 816–821. <https://doi.org/10.1126/science.1225.829>.
- Joga, M.R., M.J. Zotti, G. Smagghe, and O. Christiaens. 2016. RNAi efficiency, systemic properties, and novel delivery methods for pest insect control: What we know so far. *Front. Physiol.* 7: 553. <https://doi.org/10.3389/fphys.2016.00553>.
- Kim, Y.H., M. S. Issa, A.M.W. Cooper, and K.Y. Zhu. 2015. RNA interference: Application and advances in insect toxicology and insect pest management. *Pest. Biochem. Physiol.* 120: 109–117. <https://doi.org/10.1016/j.pestbp.2015.01.002>.
- Kumar, D.R., P.S. Kumar, M.R. Gandhi, N.A. Al-Dhabi, M.G. Paulraj, and S. Ignacimuthu. 2016. Delivery of chitosan/dsRNA nanoparticles for silencing of wing development vestigial (vg) gene in *Aedes aegypti* mosquitoes. *Intl. J. Biol. Macromol.* 86: 89–95. <https://doi.org/10.1016/j.ijbiomac.2016.01.030>.
- Leader, D.P., S.A. Krause, A. Pandit, S.A. Davies, and J.A.T. Dow. 2017. FlyAtlas 2: A new version of the *Drosophila melanogaster* expression atlas with RNA-Seq, miRNA-Seq and sex-specific data. *Nucleic Acids Res.* 46 (D1): D809–D815. <https://doi.org/10.1093/nar/gkx976>.
- Lee, R.C., R.L. Feinbaum, and V. Rambros. 1993. The *C. elegans* heterochromic gene *lin-4* encodes small RNAs with antisense complementarity to *lin-14*. *Cell* 75: 843–854.
- Leggewie, M., and E. Schnettler. 2018. RNAi-mediated antiviral immunity in insects and possible application. *Curr. Opin. Virol.* 32: 108–114. <https://doi.org/10.1016/j.coviro.2018.10.004>.
- Levis, R.W., R. Ganesan, K. Houtchens, L.A. Tolar, and F.M. Sheen. 1993. Transposons in place of telomeric repeats at a *Drosophila* telomere. *Cell* 75 (6): 1083–1093. [https://doi.org/10.1016/0092-8674\(93\)90318-k](https://doi.org/10.1016/0092-8674(93)90318-k).
- Li, F., X. Zhao, M. Li, K. He, C. Huang, Y. Zhou, Z. Li, and J.R. Walters. 2019. Insect genomes: Progress and challenges. *Insect Mol. Biol.* 28 (6): 739–758. <https://doi.org/10.1111/imb.12599>.
- Li, H., A.J. Bowling, P. Gandra, M. Rangasamy, H.E. Pence, R.E. McEwan, C. Khajuria, B.D. Siegfried and K. Narva. 2018. Systemic RNAi in western corn rootworm, *Diabrotica virgifera virgifera*, does not involve transitive pathways. *Insect Sci.* 25: 45–56. <https://doi.org/10.1111/1744-7917.12382>.
- Li, T., Y. Xia, X. Xu, G. Wei, and L. Wang. 2020. Functional analysis of *Dicer-2* gene in *Bombyx mori* resistance to BmNPV virus. *Arch. Insect Biochem. Physiol.* 105: e21724. <https://doi.org/10.1002/arch.21724>.
- Ling, L., V.A. Kokoza, C. Zhang, E. Aksoy, and A.S. Raikhel. 2017. MicroRNA-277 targets insulin-like peptides 7 and 8 to control lipid metabolism and reproduction in *Aedes aegypti* mosquitoes. *Proc. Natl. Acad. Sci. USA* 114: E8017–E8024. <https://www.pnas.org/cgi/doi/10.1073/pnas.1710970114>.
- Liu, Z.-L., J. Xu, L. Ling, D.-H., Yang, S.-Q. Chen, and Y.-P. Huang. 2020. MicroRNA-2738 regulates gene expression in the sex determination pathway in *Bombyx mori*. *Insect Sci.* 27: 646–654. <https://doi.org/10.1011/1744-7917.12694>.
- Lule-Chávez, A.N., R. Carballar-Lejarazú, J.L. Cabrera-Ponce, H. Lanz-Mendoza and J.E. Ibabba. 2021. Genetic transformation of mosquitoes by microparticle bombardment. *Insect Mol. Biol.* 30 (1): 30–41. <https://doi.org/10.1111/imb.12670>.

- Luo, W., L.-X. Huang, S.-K. Qin, X. Zhang, Q.-L. Feng, J. Gu, and L.-H. Huang. 2020. Multiple microRNAs control ecdysone signaling in the midgut of *Spodoptera litura*. *Insect Sci.* 27 (6): 1208–1223. <https://doi.org/10.1111/1744-7917.12745>.
- Ma, L., L. Liu, Y. Zhao, L. Yang, C. Chen, Z. Li, Z. Lu, and E.A. McGraw. 2020. JNK pathway plays a key role in the immune system of the pea aphid and is regulated by microRNA-184. *PLoS Pathog.* 16 (6): e1008627. <https://doi.org/10.1371/journal.ppat.1008627>.
- Macias, V.M., J.R. Ohm, and J.L. Rasgon. 2017. Gene drive for mosquito control: Where did it come from and where are we headed. *Int. J. Environ. Res. Public Health* 14: 1006. <https://doi.org/10.3390/ijerph14091006>.
- Martin, A., N.S. Wolcott, and L.A. O'Donnell. 2020. Bringing immersive science to undergraduate laboratory courses using CRISPR gene knockouts in frogs and butterflies. *J. Exp. Biol.* 223: jeb208793. <https://doi.org/10.1242/jeb.208793>.
- McFarlane, M., M. Laureti, T. Levée, S. Terry, A. Kohl, and E. Ponderville. 2021. Improved transient silencing of gene expression in the mosquito female *Aedes aegypti*. *Insect Mol. Biol.* 30 (3): 355–365. <https://doi.org/10.1111/imb.12700>.
- Matsunami, M., M. Nozawa, R. Suzuki, K. Toga, Y. Masuoka, K. Yamaguchi, K. Maekawa, S. Shigenobu, and T. Miura. 2019. Caste-specific microRNA expression in termites: insights into soldier differentiation. *Insect Mol. Biol.* 28 (1): 86–98. <https://doi.org/10.1111/imb.12530>.
- Matthews, B.J., and L.B. Voshall. 2020. How to turn an organism into a model organism in 10 “easy” steps. *J. Exp. Biol.* 223: jeb218198. <https://doi.org/10.1242/jeb.218198>.
- Meccariello, A., K.T. Tsoumani, A. Gravina, P. Primo, M. Buonanno, K.D. Mathiopoulos, and G. Saccone. 2020. Targeted somatic mutagenesis through CRISPR/Cas9 ribonucleoprotein complexes in the olive fruit fly, *Bactrocera oleae*. *Arch. Insect Biochem. Physiol.* 104: e21667. <https://doi.org/10.1002/arch.21667>.
- Meister, G. 2013. Argonaute proteins: Functional insights and emerging roles. *Nat. Rev. Genet.* 13: 447–459. <https://doi.org/10.1038/nrg3462>.
- Mérel, V., M. Boulesteix, M. Fablet, and C. Nieira. 2020. Transposable elements in *Drosophila*. *Mob. DNA* 11: 23. <https://doi.org/10.1186/s13100-020-00213-z>.
- Minet, C., S. Thévenon, I. Chantal, P. Solano, and D. Berthier. 2018. Mini-review on CRISPR-Cas9 and its potential applications to help controlling neglected tropical diseases caused by Trypanosomatidae infection. *Gen. Evol.* 63: 326–331. <https://doi.org/10.1016/j.meegid.2018.02.030>.
- Mukherjee, K., A. Baudach, H. Vogel, and A. Vilcinskis. 2020. Seasonal phenotype-specific expression of microRNAs during metamorphosis in the European map butterfly *Araschnia levana*. *Arch. Insect Biochem. Physiol.* 104: 1. <https://doi.org/10.1002/arch.21657>.
- Munawar, K., A.M. Alahmed, and S.M.S. Khalil. 2020. Delivery methods for RNAi in mosquito larvae. *J. Insect Sci.* 20 (4): 12, 1–8. <https://doi.org/10.1093/jisesa/ieaa074>.
- Ni, X.-Y., Z.-D. Zhou, J. Huang, and X. Qian. 2020. Targeted gene distribution by CRISPR/xCas9 system in *Drosophila melanogaster*. *Arch. Insect Biochem. Physiol.* 104: e21662. <https://doi.org/10.1002/arch.21662>.
- Nouzova, M., K. Etebari, F.G. Noriega, and S. Asgari. 2018. A comparative analysis of *corpora allata-corpora cardiaca* microRNA repertoires revealed significant changes during mosquito metamorphosis. *Insect Biochem. Mol. Biol.* 96: 10–18. <https://doi.org/10.1016/j.ibmb.2018.03.007>.
- Palli, S.R. 2014. RNA interference in Colorado potato beetle: Steps toward development of dsRNA as a commercial insecticide. *Curr. Opin. Insect Sci.* 6: 1–8. <https://doi.org/10.1016/j.cois.2014.09.011>.
- Palli, S.R. 2020. RNAi in insects: Contributions from Palli laboratory. *Arch Insect Biochem. Physiol.* 104: e21722. <https://doi.org/10.1002/aech.21722>.
- Peccoud, J., V. Loiseau, R. Cordaux, and C. Gilbert. 2017. Massive horizontal transfer of transposable elements in insects. *Proc. Natl. Acad. Sci. USA* 114 (18): 4721–4726. <https://doi.org/10.1073/pnas.1621178114>.
- Peng, Y., K. Wang, J. Chen, J. Wang, H. Zhang, L. Ze, G. Zhu, C. Zhao, H. Xiao, and Z. Han. 2020. Identification of a double-stranded RNA-degrading nuclease influencing both ingestion and injection RNA interference efficiency in the red flour beetle *Tribolium castaneum*. *Insect Biochem. Mol. Biol.* 125: 103440. <https://doi.org/10.1016/j.ibmb.2020.103440>.
- Prentice, K., G. Smagghe, G. Gheysen, and O. Christiaens. 2019. Nuclease activity decreases the RNAi response in the sweet-potato weevil *Cylas puncticollis*. *Insect Biochem. Mol. Biol.* 110: 80–89. <https://doi.org/10.1016/j.ibmb.2019.04.001>.
- Rebollo, R., M.T. Romanish, and D.L. Mager. 2012. Transposable elements: An abundant and natural source of regulatory sequences for host genes. *Annu. Rev. Genet.* 46: 21–42. <https://doi.org/10.1146/annurev-genet-110711-155621>.
- Reid, W., and D.A. O'Brochta. 2016. Applications of genome editing in insects. *Curr. Opin. Insect Sci.* 13: 43–54. <https://doi.org/10.1016/j.cois.2015.11.001>.
- Reiss, D., G. Mialdea, V. Miele, D.M. de Vienne J. Peccoud, C. Gilbert, L. Duret, and S. Charlat. 2019. Global survey of mobile DNA horizontal transfer in arthropods reveals Lepidoptera as a prime hotspot. *PLoS Genet.* 15 (2): e1007965. <https://doi.org/10.1371/journal.pgen.1007965>.
- Rubio, M., J.L. Maestro, M.-D. Piulachs, and X. Belles. 2018. Conserved association of Argonaute 1 and 2 proteins with miRNA and siRNA pathways throughout insect evolution, from cockroaches to flies. *Biochim. Biophys. Acta (BBA) – Gene Regul. Mech.* 1861 (6): 554–560. <https://doi.org/10.1016/j.bbagr.2018.04.001>.
- Rückert, C., A.N. Prasad, S.M. Garcia-Luna, A. Robison, N.D. Grubaugh J. Weger-Lucarelli, and G.D. Ebel. 2019. Small RNA responses of *Culex* mosquitoes and cell lines during acute and persistent virus infection. *Insect Biochem. Mol. Biol.* 109: 13–23. <https://doi.org/10.1016/j.ibmb.2019.04.008>.
- Scharf, M.E., and B.F. Peterson. 2021. A century of synergy in termite symbiosis research: Linking the past with the new genomic insights. *Annu. Rev. Entomol.* 66: 23–43. <https://doi.org/10.1146/annurev-ento-022420-074746>.
- Scott, J.C., K. Michel, L.C. Bartholomay, B.D. Siegfried, W.B. Hunter, G. Smagghe, K.Y. Zhu, and A.E. Douglas. 2013. Towards the elements of successful insect RNAi. *J. Insect Physiol.* 59: 1212–1221. <https://doi.org/10.1016/j.jinsphys.2013.08.014>.
- Singh, C.P. 2020. Role of microRNAs in insect-baculovirus interactions. *Insect Biochem. Mol. Biol.* 127: 103459. <https://doi.org/10.1016/j.ibmb.2020.103459>.
- Song, J., W. Li, H. Zhao, L. Gao, Y. Fan, and S. Zhou. 2018. The microRNAs let-7 and miR-278 regulate insect metamorphosis and oogenesis by targeting the juvenile hormone early-response gene *Krüppel-homolog 1*. *Development* 145 (24): dev170670. <https://doi.org/10.1242/dev.170670>.
- Spradling, A.C., D. Stern, A. Beaton, E.J. Rhem, T. Laverty, N. Mozden, S. Misra, and G.M. Rubin. 1999. The Berkeley *Drosophila* Genome Project gene disruption project: Single

- P-element insertions mutating 25% of vital *Drosophila* genes. *Genetics* 153 (1): 135–177. <https://pubmed.ncbi.nlm.nih.gov/10471706/>.
- Spradling, A.C., D.M. Stern, I. Kiss, J. Roote, T. Lavery, and G.M. Rubin. 1995. Gene disruptions using P transposable elements: An integral component of the *Drosophila* genome project. *Proc. Natl. Acad. Sci. USA* 92 (24): 10824–10830. <https://doi.org/10.1073/pnas.92.24.10824>.
- Sugahara, R., S. Tanaka, A. Jouraku, and T. Shiotsuki. 2017. Geographic variation in RNAi sensitivity in the migratory locust. *Gene* 605: 5–11. <https://doi.org/10.1016/j.gene.2016.12.028>.
- Swevers, L., J.V. Broeck, and G. Smagghe. 2013. The possible impact of persistent virus infection on the function of the RNAi machinery in insects: A hypothesis. *Front. Physiol.* 4: 319. <https://doi.org/10.3389/fphys.2013.00319>.
- Tassetto, M., M. Kunitomi, and R. Andino. 2017. Circulating immune cells mediate a systemic RNAi-based adaptive antiviral response in *Drosophila*. *Cell* 169 (2): 314–325. <https://doi.org/10.1016/j.cell.2017.03.033>.
- Tassetto, M., M. Kunitomi, Z.J. Whitfield, P.T. Dolan, I. Sanchez-Vargas, M. Garcia-Knight, I. Ribiero, T. Chen, and K.E. Olson. 2019. Control of RNA viruses in mosquito cells through acquisition of vDNA and endogenous viral elements. *eLife* 8: e41244. <https://doi.org/10.7554/eLife.41244>.
- Tomoyasu, Y., and M.S. Halfon. 2020. How to study enhancers in non-traditional insect models. *J. Exp. Biol.* 223: jeb212241. <https://doi.org/10.1242/jeb.212241>.
- Tyagi, S., K. Kesiraju, M. Saakre, M. Rathinam, V. Raman, D. Pattanayak, and R. Sreevathsa. 2020. Genome editing for resistance to insect pests: An emerging tool for crop improvement. *ACS Omega* 5 (33): 20674–20683. <https://doi.org/10.1021/acsomega.0c01435>.
- Wang, K., Y. Peng, J. Pu, W. Fu, J. Wang, and Z. Han. 2016. Variation in RNAi efficacy among insect species is attributable to dsRNA degradation *in vivo*. *Insect Biochem. Mol. Biol.* 77: 1–9. <https://doi.org/10.1016/j.ibmb.2016.07.007>.
- Wang, K., Y. Peng, W. Fu, Z. Chen, and Z. Han. 2019a. Key factors determining variations in RNA interference efficacy mediated by different double-stranded RNA lengths in *Tribolium castaneum*. *Insect Mol. Biol.* 28 (2): 235–245. <https://doi.org/10.1111/imb.12546>.
- Wang, L., J. Wang, Y. Ma, P. Wan, K. Liu, S. Kong, Y. Xiao, D. Xu, K. Wu, J.A. Fabrick, X. Li, and B.E. Tabashnik. 2019b. Transposon insertion causes cadherin mis-splicing and confers resistance to Bt cotton in pink bollworm from China. *Sci. Rep.* 9: 7479. <https://doi.org/10.1038/s41598-019-43889-x>.
- Wang, M., S. Zhang, Y. Shi, Y. Yang, and Y. Wu. 2020. Global gene expression changes induced by knockout of a protease gene cluster in *Helicoverpa armigera* with CRISPR/Cas9. *J. Insect Physiol.* 122: 104023. <https://doi.org/10.1016/j.jinphys.2020.104023>.
- Wang, Y.-K., J.-P. Li, T.-T. Li, R. Liu, L.-Y. Jia, X.-Q. Wei, J.-H. Xiao, and D.-W. Huang. 2017. Comparative profiling of microRNAs and their association with sexual dimorphism in the fig wasp *Ceratosolen solmsi*. *Gene* 633: 54–60. <https://doi.org/10.1016/j.gene.2017.08.030>.
- Wang, Z.-Z., X.-Q. Ye, M. Shi, F. Li, Z.-H. Wang, Y.-N. Zhou, Q.-J. Gu, X.-T. Wu, C.-L. Yin, D.-H. Guo, R.-M. Hu, N.-N. Hu, T. Chen, B.-Y. Zheng, J.-N. Zou, L.-Q. Zhan, S.-J. Wei, Y.-P. Wang, J.-H. Huang, X.-D. Fang, M.R. Strand, and X.-X. Chen. 2018. Parasitic insect-derived miRNAs modulate host development. *Nat. Commun.* 9: 1. <https://www.nature.com/articles/s41467-018-04504-1>.
- Weedall, G.D., J.M. Riveron, J. Hearn, H. Irving, C. Kamdem, C. Fouet, B.J. White, and C.S. Wondji. 2020. An Africa-wide genomic evolution of insecticide resistance in the malaria vector *Anopheles funestus* involves selective sweeps, copy number variations, gene conversion and transposons. *PLoS Genet.* 16 (6): e1008822. <https://doi.org/10.1371/journal.pgen.1008822>.
- Wu, K., C. Camargo, E. Fishilevich, K.E. Narva, X. Chen, C.E. Taylor, and B.D. Siegfried. 2017. Distinct fitness costs associated with the knockdown of RNAi pathway genes in western corn rootworm adults. *PLoS* 12 (12): e0190208. <https://doi.org/10.1371/journal.pone.0190208>.
- Wu, K., P.D. Shirk, C.E. Taylor, R.B. Furlong, B.D. Shirk, D.H. Pinheiro, and B.D. Siegfried. 2018b. CRISPR/Cas9 mediated knockdown of the *abdominal-A* homeotic gene in the fall armyworm moth (*Spodoptera frugiperda*). *PLoS* 13 (12): e0208647. <https://doi.org/10.1371/journal.pone.0208647>.
- Wu, K., C.E. Taylor, E. Fishilevich, K.E. Narva, and B.D. Siegfried. 2018a. Rapid and persistent RNAi response in western corn rootworm adults. *Pest. Biochem. Physiol.* 150: 66–70. <https://doi.org/10.1016/j.pestbp.2018.07.002>.
- Yoon, J.-S., D. Gurusamy, and S.R. Palli. 2017. Accumulation of dsRNA in endosomes contributes to inefficient RNA interference in the fall armyworm, *Spodoptera frugiperda*. *Insect Biochem. Mol. Biol.* 90: 53–60. <https://doi.org/10.1016/j.ibmb.2017.09.011>.
- Yoon, J.-S., J.N. Shukla, Z.J. Gong, K. Mogilicherla, and S.R. Palli. 2016. RNA interference in the Colorado potato beetle, *Leptinotarsa decemlineata*: Identification of key contributors. *Insect Biochem. Mol. Biol.* 78: 78–88. <https://doi.org/10.1016/j.ibmb.2016.09.002>.
- Zhang, G., M. Hussain, S.L. O'Neill, and S. Asgari. 2013. *Wolbachia* uses a host microRNA to regulate transcripts of a methyltransferase, contributing to dengue virus inhibition in *Aedes aegypti*. *Proc. Natl. Acad. Sci. USA* 110 (25): 10276–10281. <https://www.pnas.org/cgi/doi/10.1073/pnas.1303603110>.
- Zhang, S., S. An, K. Hoover, Z. Li, X. Li, X. Liu, Z. Shen, H. Fang, V.I.D. Ros, Q. Zhang, and X. Liu. 2017. Host miRNAs are involved in hormonal regulation of HaSNPV-triggered climbing behavior in *Helicoverpa armigera*. *Mol. Ecol.* 27 (2): 459–475. <https://doi.org/10.1111/mec.14457>.
- Zhu, G.-H., S.C.R.R. Chereddy, J.L. Howell, and S.R. Palli. 2020. Genome editing in the fall armyworm, *Spodoptera frugiperda*: Multiple sgRNA/Cas9 method for identification of knockouts in one generation. *Insect Biochem. Mol. Biol.* 122: 103373. <https://doi.org/10.1016/j.ibmb.2020.103373>.
- Zhu, K.Y., and S.R. Palli. 2020. Mechanisms, application, and challenges of insect RNA interference. *Annu. Rev. Entomol.* 65: 293–311. <https://doi.org/10.1146/annurev-ento-011019-025224>.
- Zotti, M., E.A. dos Santos, D. Cagliari, O. Christianens, C.N.T. Taning, and G. Smagghe. 2018. RNA interference technology in crop protection against arthropod pests, pathogens and nematodes. *Pest. Manag. Sci.* 74: 1239–1250. <https://doi.org/10.1002/ps.4813>.