

PESTİSİD, İNSEKTİSİD VE HERBİSİDLER

Fethi Ahmet ATILGAN¹

GİRİŞ

Tüm haşere öldürücü ajanları ifade etmek için kullanılan genel bir terim olan **pestisidler**, böcek öldürücüler, herbisidler, kemirgen öldürücüler, mantar öldürücüler gibi çok sayıda kimyasalı kapsar. Bu kimyasalların çoğu, insanlar dahil çok çeşitli organizmaları etkileyen zehirlerdir. (1) Zararlıların kontrolü için kullanılan kimyasal pestisidlerin en geniş kullanım alanı tarımdır. Ayrıca halk sağlığı alanında da malaria ve deng gibi vektör aracılıklı hastalıkların önlenmesinde kullanılmaktadırlar.(2)

Hedeflerine göre;algisid (yosun, alg), avisid (kuş), bakterisid, fungusid, herbisid (zararlı ot, tohum), insektisid (böcek), mitisid (akar),molluskisid (salyangoz), nematisid (solucan), piskisid (balık), rodentisid (kemirgen) gibi isimler alırlar.

Gaz, toz ve püskürtme şeklinde kullanıma sunulmuş olan pestisidler, etki modlarına, kimyasal yapılarına, fonksiyonel gruplarına ve toksisitelerine göre de çeşitli sınıflara ayrılabilirler. Organik olanlar inorganiklere göre suda daha az çözünürler. (2,3)

İnsektisidler:

Kişisel böcek kovucu olarak pazarlanan DEET haricinde insektisidleri beş majör sınıfta incelemek mümkündür.(Tablo1) Kolinesteraz inhibitörü olan organofosfat ve karbamatlı insektisidler daha etkili olmaları ve dokularda kalıcılıklarının olmaması sebebiyle organoklorinli insektisidlere tercih edilir olmuşlardır.(4)

¹ Uzm. Dr. Fethi Ahmet ATILGAN, Malatya Eğitim Araştırma Hastanesi, Acil Tıp Bölümü faatilgan@gmail.com

sıvılar verilmelidir. Şiddetli zehirlenmelerde asidoz ve hipotansiyon IV sıvılara dirençli olabilir ve sodyum bikarbonat ve vazopresörler gerekebilir.(14)

Glufosinat:

Bir glutamik asit analogu olan glufosinat, sürfaktanla birleştirilir. Glifosatta olduğu gibi, bu ürünlerin yutulması, korozif yaralanma, gastrointestinal semptomlar ve asidoz gibi semptomlara yol açabilir. Bununla birlikte, glufosinat, SSS'nde gecikmiş bulgulara neden olabileceği için farklıdır. Alımdan 4 ila 12 saat sonra ataksi, bilinç değişikliği, koma ve santral apne görülebilir. Alımdan 29 saat sonra görülen ve günlerce sürebilen nöbetler bildirilmiştir. Tedavi destekleyicidir. Büyük miktarda yutulduktan sonraki ilk 1 saat içinde görülen hastalar için aktif kömür düşünülebilir.(14,72)

KAYNAKLAR

1. Aaron, CK., Rhee, JW., Dolcourt, BA.(2013). Volume 161, Pesticides. John A Marx (Ed.),*Rosen's Emergency Medicine Concepts and Clinical Practice* içinde (s. 2052-2060). Philadelphia: Mosby Elsevier
2. Kim K.,Kabir E., Jahan SA. Exposure to pesticides and associated human health effects. *Science of the Total Environment* 575 2017; 525-535.
3. Kurutaş EB, Kılınç M. Pestisitlerin Biyolojik Sistemler Üzerine Etkisi. *Arşiv* 2003; 12:215
4. Judith E Tintinalli, Editor In Chief, (2020), *Tintinalli's Emergency Medicine: A Comprehensive Study Guide* (9th Edition) içinde 1300-1308.USA:McGraw-Hill
5. Johnson MK, Jacobsen D, Meredith TJ. Evaluation of antidotes for poisoning by organophosphorus pesticides. *Emergency Medicine* 2000; 12; 22-37
6. Sidhua GK.,SinghaS.,KumarB.V. Toxicity monitoring and biodegradation of organophosphate pesticides: A review, *Critical Reviews in Environmental Science and Technology* 2019 DOI:10.1080/10643389.2019.1565554
7. Joshi S., Biswas B., Malla G. Management of organophosphorus poisoning. *Update in Anaesthesia* 2005; 19: 31-35
8. Nishijima DK. Toxicity, organicphosphorous compounds and carbamates. Article Last Updated. 27.12.2020 tarihinde (<http://www.emedicine.com/article/816221-owerview>) adresinden ulaşılmıştır
9. Hulse EJ, Haslam JD, Emmet SR. Organophosphorus nerve agent poisoning: managing the poisoned patient.. *British Journal of Anaesthesia* 2019; 123 (4):457e463 doi.org/10.1016/j.bja.2019.04.061
10. Reddy KB.,Navya B., Priya BV.Evaluation of Organophosphorus Poisoning: Case Series. *Journal of Clinical Case Reports* 2016; 6:8 DOI:10.4172/2165-7920.1000853
11. Kwong TC. Organophosphate pesticides: biochemistry and clinical toxicology. *The-*

- rapeutic Drug Monitoring* 2002; 24: 144-149
12. Sungur M., Guven M. Intensive care management of organophosphate insecticide poisoning. *Critical Care* 2001; 5: 211-215.
 13. Tsatsakis AM, Aquridakis P, Michalodimitrakis MN. Experiences with acute OP poisonings in Crete. *Veterinary and Human Toxicology* 1996; 38: 101-107
 14. Cannon, RD., Ruha, AM. (2013). İnsecticides, Herbicides, and Rodenticides. James G. Adams (Ed.). *Emergency Medicine Clinical Essentials* içinde (s. 1246-1256). Philadelphia: Elsevier
 15. Kayaalp, SO.(2002). *Rasyonel Tedavi Yönünden Tıbbi Farmakoloji*. (10. Baskı). Ankara: Feryal Matbaası
 16. Akbel E., Arslan-Acaroz D., Demirel HH. The subchronic exposure to malathion, an organophosphate pesticide, causes lipid peroxidation, oxidative stress, and tissue damage in rats: the protective role of resveratrol. *Toxicology Research* 2018;7:503 DOI:10-1039/c8tx00030a
 17. Jokanović M. Neurotoxic effects of organophosphorus pesticides and possible association with neurodegenerative diseases in man: A review. *Toxicology* 410 2018 DOI:10.1016
 18. Jayawardane P, Senanayake N, Dawson A. Electrophysiological correlates of intermediate syndrome following acute organophosphate poisoning. *Clinical Toxicology* 2009; 47: 193-205
 19. Ehrich M, Correll L, Veronesi B. Acetylcholinesterase and neuropathy target esterase inhibitions in neuroblastoma cells to distinguish organophosphorus compounds causing acute and delayed neurotoxicity. *Fundam Appl Toxicol* 1997; 38: 55-63
 20. Eyer P. Neuropsychopathological changes by organophosphorus compounds-a review. *Human Experimental Toxicology* 1995; 14: 857-866
 21. Casale GP, Cohen SD, Di Capua RA. The effects of organophosphate-induced cholinergic stimulation on the antibody response to sheep erythrocytes in inbred mice. *Toxicol Appl Pharmacol* 1983; 68: 198-205.
 22. Karalliedde L. Organophosphorus poisoning and anaesthesia. *Anaesthesia* 1999; 54: 1073-1088
 23. Petroianu G, Toomes LM, Petroianu A, Control of blood pressure, heart rate and haematocrit during high-dose intravenous paraoxon exposure in mini pigs. *J Appl Toxicol* 1998; 18: 293-298
 24. El-Ebiary AA, Soliman MA, Hafez EM. Electrocardiographic Findings and Prognostic Value of Long QTc Interval in Acute Organophosphate Insecticide Poisoning. *Ain Shams Journal of Forensic Medicine and Clinical Toxicology* Jan 2016, 26: 1- 6
 25. Aygün D. Diagnosis in an acute organophosphate poisoning: report of three interesting cases and review of the literature. *Europa Journal of Emergency Medicine* 2005; 12: 102-103
 26. Bissbort SH, Vermaak WJ, Elias J. Novel test and its automation for the determination of erythrocyte acetylcholinesterase and its application to organophosphate exposure. *Clin Chim Acta* 2001; 303:139-145.

27. Yılmaz M, Sebe A, Ay M, Gürger M. Organophosphate poisoning and intermediate sendrom. *Archive Med Rev J* 2016; 25: 70-83
28. Weinbroum AA. Pathophysiological and clinical aspects of combat anticholinesterase poisoning. *British Medical Bulletin* 2005; 72: 119-133
29. Guven M, Sungur M, Tanrıverdi M. Evaluation of the patients with acute intoxication. *Turkish Journal of Medical Sciences* 2002; 32:169-172
30. Sungur M, Güven M. Intensive care management of organophosphate insecticide poisoning. *Critical Care* 2001, 5:211-215
31. Saha uygulaması çalışması. T.C. Sağlık Bakanlığı Birinci Basamağa Yönelik Zehirlenmeler Tanı ve Tedavi Rehberleri. 2006
32. Eddleston M, Dawson A, Karalliedde L.. Early management after self-poisoning with an organophosphorus or carbamate pesticide; A treatment protocol for junior doctors. *Critical Care* 2004; 8: 391-397
33. Robenshtok E, Luria S, Tashma Z. Adverse reaction to atropine and the treatment of organophosphate intoxication. *The Israel Medical Association Journal* 2002; 4(7):535-539
34. Gülen M. (2016). Pestisidler. Başar Cander (Ed.). *Cander Acil Tıp Temel Başvuru Kitabı* içinde (s. 2037-2055). İstanbul: İstanbul Tıp Kitabevleri
35. Pajoumand A, Shadnia S, Rezaie A. Benefits of magnesium sulfate in the management of acute human poisoning by organophosphorus insecticides. *Human & Experimental Toxicology* 2000; 23: 565-569.
36. Balali-Mood M, Shariat M. Treatment of organophosphate poisoning. Experience of nevre agents and acute pesticide poisoning on the effects of oximes. *Journal of Physiogy-l Paris* 1998; 92: 375-378
37. Guven M, Sungur M, Eser B. The effects of fresh frozen plasma on cholinesterase levels and outcomes in patients with organophosphate poisonings. *Journal of Toxicology: Clinical Toxicology* 2004; 42: 612-623
38. Yılmaz M, Sebe A, Ay MO. Effectiveness of therapeutic plasma exchange in patients with intermediate syndrome due to organophosphate intoxication. *American Journal of Emergency Medicine* 2013; 31: 953-957
39. Parikka H, Toivonen T, Naukkarinen V. Decreases by magnesium of QT dispersion and ventricular arrhythmias in patients with acute myocardial infarction. *European Heart Journal* 1999; 20: 111-120
40. Eddleston M, Chowdhury FR. Pharmacological Treatment of organophosphorus insecticide poisoning: the old and the (possible) new. *British Journal of Clinical Pharmacology* 2015 DOI:10.1111/bcp.12784
41. Kumar S, Kaushik G, Dar MA. Microbial Degradation of Organophosphate Pesticides: A Review. *Pedosphere*.2018;28:190-208
42. Kiss Z, Fazekas T. Organophosphates and torsade de pointes ventricular tachycardia. *Journal of Royal Socitey of Medicine* 1983;76: 983-984
43. Brvar M, Chan MY, Dawson AH. Magnesium sulfate and calcium channel blocking drugs as antidotes for acute organophosphorus insecticide poisoning – a systematic

- review and meta-analysis. *Clinical Toxicology* 2018;56(8):725-736
44. Motawei SM, Elbiomy AA Sodium Bicarbonate and N-Acetyl Cysteine in Treatment of Organophosphorus Poisoning Cases: A Randomized Controlled Clinical Trial. *Toxicology* 2017 DOI: 10.4172/2476-2067.1000123
 45. Chhabria BA, Bhalla A, Shafiq N. Lipid emulsion for acute organophosphate insecticide poisoning – a pilot observational safety study. *Clinical Toxicology* 2019;57:318-324
 46. MP Stojiljković, R Škrbić, M Jokanović. Efficacy of antidotes and their combinations in the treatment of acute carbamate poisoning in rats *Toxicology* 2018;418:113-124
 47. Jayaraj R, Megha P, Sreedev P. Organochlorine pesticides, their toxic effects on living organisms and their fate in the environment. *Interdisciplinary Toxicology* 2017;9 DOI: 10.1515/intox-2016-0012
 48. Das YK, Guven D, Guvenc D. Organochlorine compounds in the adipose tissue of urban and rural women who gave birth by cesarean delivery in northern Turkey. *Toxicol. Res.*, 2017; 6:664
 49. Docea AO, Vassilopoulou L, Fragou CYP polymorphisms and pathological conditions related to chronic exposure to organochlorine pesticides. *Toxicology Reports* 2017;4:335-341
 50. Genuis SJ, Lane K, Birkholz D. Human Elimination of Organochlorine Pesticides: Blood, Urine, and Sweat Study. *Hindawi Publishing Corporation BioMed Research International* 2016: Article ID 1624643:DOI:10.1155/2016/1624643
 51. Xu H, Lybran D, Bennewitz S. Production of trans-chrysanthemoid acid, the monoterpene acid moiety of natural pyrethrin insecticides, in tomato fruit. *Metab Eng.* 2018; 47: 271–278. doi:10.1016
 52. Xu H, Li W, Schillmiller AL. Pyrethric acid of natural pyrethrin insecticide: complete pathway elucidation and reconstitution in *Nicotiana benthamiana*. *New Phytologist* 2019; 223: 751–765 doi: 10.1111/nph.15821
 53. Insecticide Fact Sheet. *Journal Of Pesticide Reform/* Spring 2002 : Vol. 22 No: 114
 54. Azab M, Khabour OF, Alzoubi KH. Assessment of genotoxicity of pyrethrin in cultured human lymphocytes. *Drug and Chemical Toxicology* 2016 DOI: 10.1080/01480545.2016.1209679
 55. Bersselaar LR, Hoeven JG, Jong B. Suicide after inhaling a pyrethrin containing insecticide spray. *Article in BMJ Case Reports* 2019. DOI: 10.1136/bcr-2018-227936
 56. Bass C, Field LM. Neonicotinoids. *Current Biology* 2018;28: 761-783
 57. Todey SA, Fallon AM, Arnold WA. Neonicotinoid Insecticide Hydrolysis and Photolysis: Rates and Residual Toxicity. *Environmental Toxicology and Chemistry*. 2018;37(11):2797-2809
 58. Silva CL, Rooij W, Verweij RA. Toxicity in Neonicotinoids to *Folsomia candida* and *Eisenia andrei*. *Environmental Toxicology and Chemistry*. 2020;39(3):548–555
 59. Shrestha B, Lee Y. Cellular and molecular mechanisms of DEET toxicity and disease-carrying insect vectors: a review. *Genes and Genomics*. 2020. DOI: 10.1007/s13258-020-00991-z

60. Agency for Toxic Substances and Disease. Toxicological Profile For DEET (N,N-Diethyl-Meta-Toluamide). *U.S. Department Of Health and Human Services*.2017
61. Dayan FE..Current Status and Future Prospects in Herbicide Discovery. *Plants*.2019;8:341 doi:10.3390
62. Islama F, Wang J, Farooq MA. Potential impact of the herbicide 2,4-dichlorophenoxyacetic acid on human and ecosystems. *Environment International*.2017. Doi:10.1016
63. Wang J, Yu W. Efficacy of high-dose ambroxol for paraquat poisoning: A meta-analysis of randomized controlled trials. *Journal of Research in Medical Sciences*. 2020;25:67
64. Wang HR,Pan J, Shang AD. Time-dependent haemoperfusion after acute paraquat poisoning. *Scientific Reports* 2017; 7: 2239. DOI:10.1038
65. Magalhães N, Carvalho F, Dinis-Oliveira RJ. Human and experimental toxicology of diquat poisoning: Toxicokinetics, mechanisms of toxicity, clinical features, and treatment. *Human and Experimental Toxicology*. 2018. Doi:10.1177/0960327118765330
66. Li S, Zhao D, Li Y. Arterial lactate in predicting mortality after paraquat poisoning A meta-analysis. *Medicine*. 2018; 97:34 doi:10.1097
67. Min Y, Ahn JH,Chan YC. Prediction of prognosis in acute paraquat poisoning using severity scoring system in emergency department. *Clinical Toxicology*.2011;49:840–845 DOI: 10.3109/15563650.2011.619137
68. Xu Y ,Lu Y .Systematic review and meta-analysis of the efficacy and safety of immunosuppressive pulse therapy in the treatment of paraquat poisoning. *Journal of Zhejiang University-Science B*. 2019;20:588–597
69. IARC Working Group on the Evaluation of Carcinogenic Risks to Humans Lyon (FR). Some Organophosphate Insecticides and Herbicides. *International Agency for Research on Cancer*. 2017. PMID: 31829533 Bookshelf ID: NBK436774
70. Landrigan PJ, Belpoggi F. The need for independent research on the health effects of glyphosate-based herbicides. *Environmental Health*. 2018;17:51
71. Van Bruggen AHC., He MM., Shin K..Environmental and health effects of the herbicide glyphosate. *Science of the Total Environment*. 2018:255-268
72. Park S, Kim DE, Park SY.Seizures in patients with acute pesticide intoxication, with a focus on glufosinate ammonium. *Human&Eperimental Toxicology* 2018;37(4) .doi.org/10.1177/0960327117705427