Agentes Praguicidas: Organoclorados
CEN 0413

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Introdução - Histórico

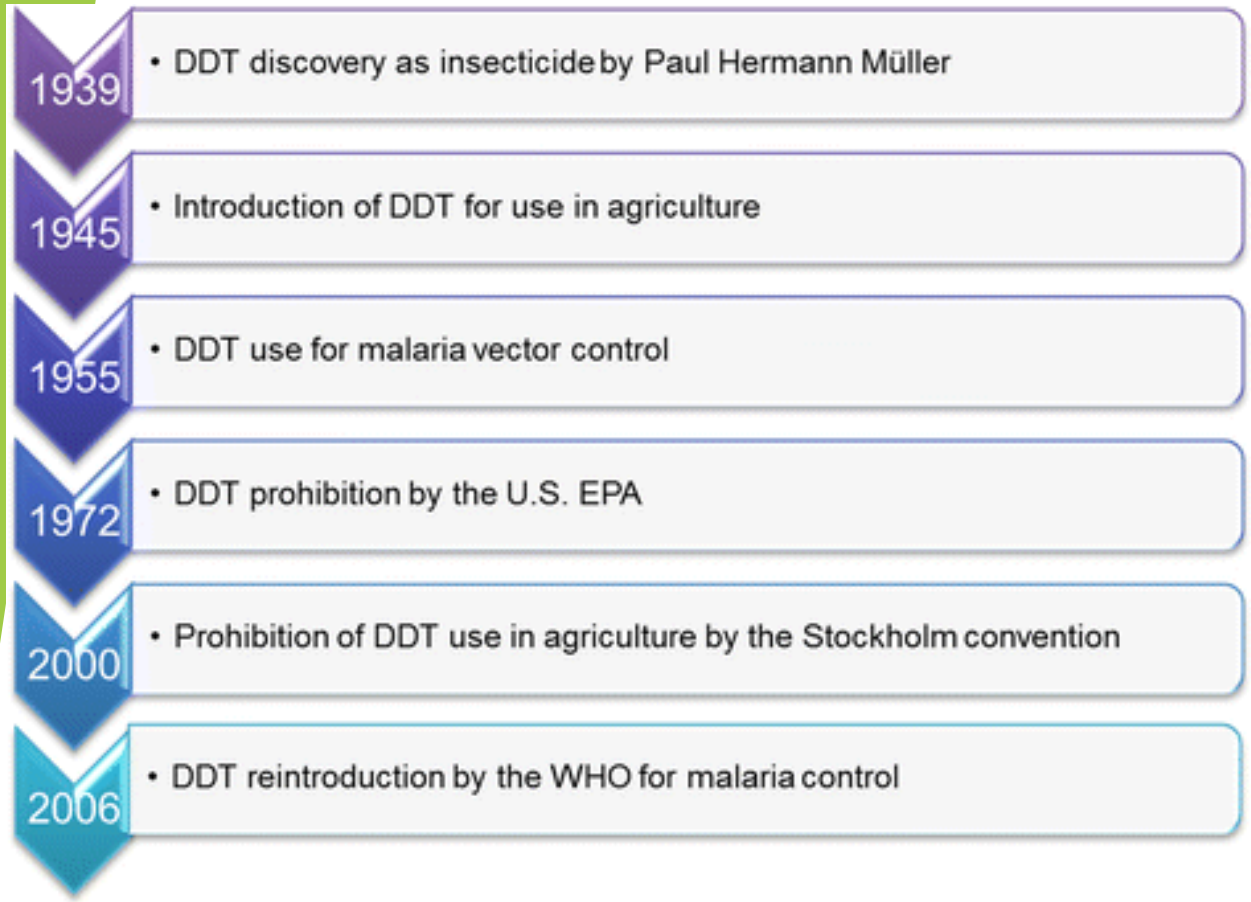

Fig. 2. Evolution of the use of DDT worldwide
From: The Environmental Issues of DDT Pollution and Bioremediation: a Multidisciplinary Review -

Mansouri, A., Cregut, M., Abbes, C. et al. The Environmental Issues of DDT Pollution and Bioremediation: a Multidisciplinary Review. Appl Biochem Biotechnol 181, 309–339 (2017). https://doi.org/10.1007/s12010-016-2214-5

Introdução - DDT ½ vida

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Table 1 The half-lives of DDTs in different environments

From: The Environmental Issues of DDT Pollution and Bioremediation: a Multidisciplinary Review

DDTs	Environment				References
	Soil	Sediment	Water	Atmosphere	
DDT	4–30 years	1–4 years	26–56 days	1.5–3 days	[25]
ODE	151–672 days	-	1–6 days	17 h – 2 days	[25, 42]
DDD	160 days	-	190 years	4 days	[25]

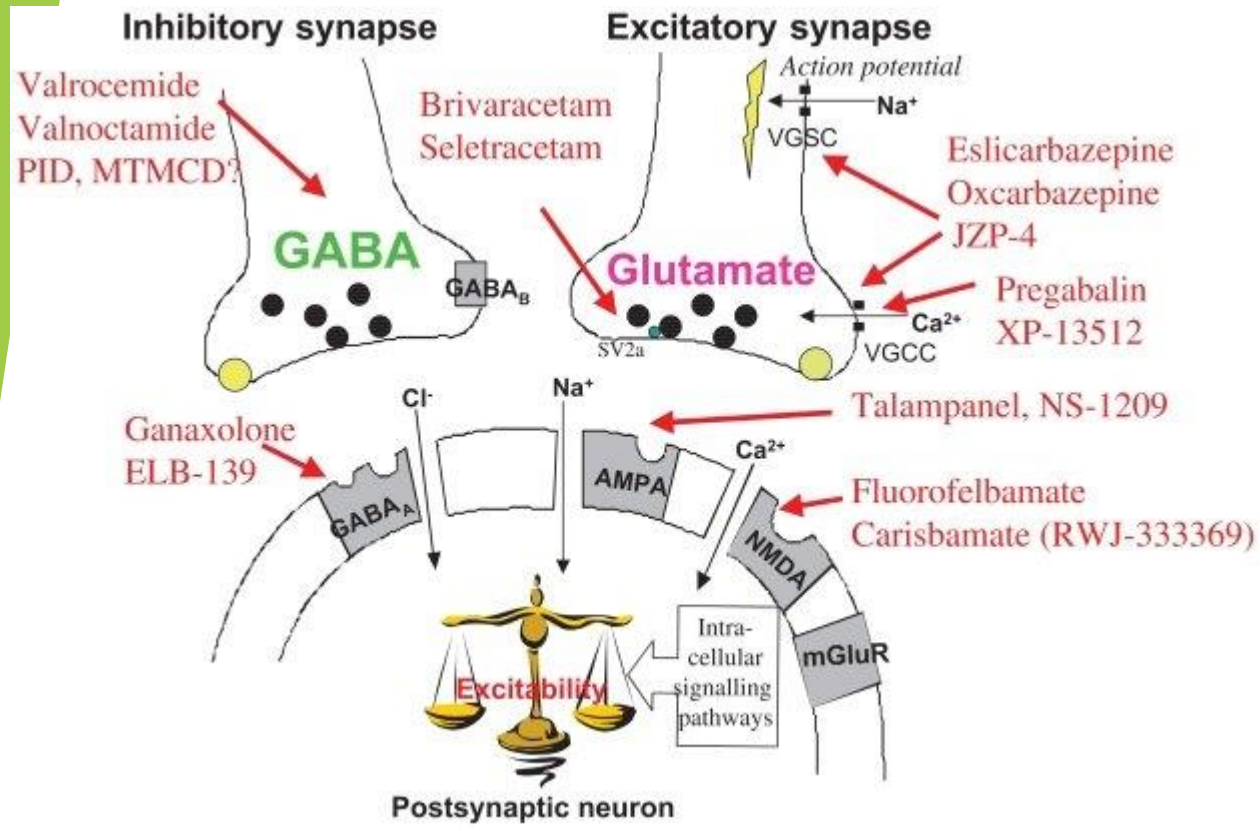
Mansouri, A., Cregut, M., Abbes, C. et al. The Environmental Issues of DDT Pollution and Bioremediation: a Multidisciplinary Review. Appl Biochem Biotechnol 181, 309–339 (2017). https://doi.org/10.1007/s12010-016-2214-5

Chemical substance					Toxicity				Ecotoxicity LC50 (µg/l)		References
Name Log KOW	Formula	Structure 3D	CAS Number	Molecular weight g.M-1	Species Rat Rabbit	Route	LD50 mg/Kg		Fish	Invertebrate	
1,1,1-dichloro Diphenyltrichloro Ethane (DDT) 6.9	$C_{14}H_9Cl_5$		50-29-3	354.49			113 1577 400		*Gambusia magna* 2 (48h) **19 (96 h)**	*Daphnia magna* 6.5 (48h) **13 (48 h)**	10 71
1,1-dichloro-2,2-bis(p-chlorophenyl) ethylene (DDE) 6	$C_{14}H_8Cl_4$		72-55-9	318.03			502 96		*Gambusia magna* 0.9 (48h) **15 (96 h)**	*Daphnia magna* 6 (48h) **14 (48 h)**	71
1,1-dichloro-2,2-bis(p-chlorophenyl) Ethane (DDD) 5.78	$C_{14}H_{10}Cl_2O$		72-54-8	320.05			1200 4000		*Gambusia magna* 0.06 (48 h) **71 (96 h)**	*Daphnia magna* 6 (48h) **87 mg/l (48 h)**	10 72 71
4-Chlorophenyl acetate 6.68	$C_8H_7ClO_2$		876-27-7	170.59			No data		*Gambusia magna* **16.6 mg/l (96 h)**	*Daphnia magna* **33,7 mg/l (48h)**	10
4,4'-dichloro-Benzophenone (DBP) 4.44	$C_{13}H_8Cl_2O$		90-98-2	251.11			200		*Gambusia magna* **1.33 mg/l (96h)**	*Daphnia magna* **0.95 mg/l (48h)**	10
1-chloro-2-2-bis-(4'-chlorophenyl) ethylene (DDMU) 5.81	$C_{14}H_8Cl_3$		1022-22-6	283.58			2700		*Gambusia magna* **0.036 mg/l (96h)**	*Daphnia magna* **0.037 mg/l (48h)**	10

Table 2. The relative toxicities of DDT and its main by-products (LC50 lethal concentration 50 %, LD50 Lethal
dose 50 %, INERIS Institut National de l'Environnement Industriel et des Risques; http://www.ineris.fr/, EPIWIN Estimation Programme Interface. http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm). white hydrogen
atoms, red oxygen atoms, green chlorine atoms, black carbons atoms

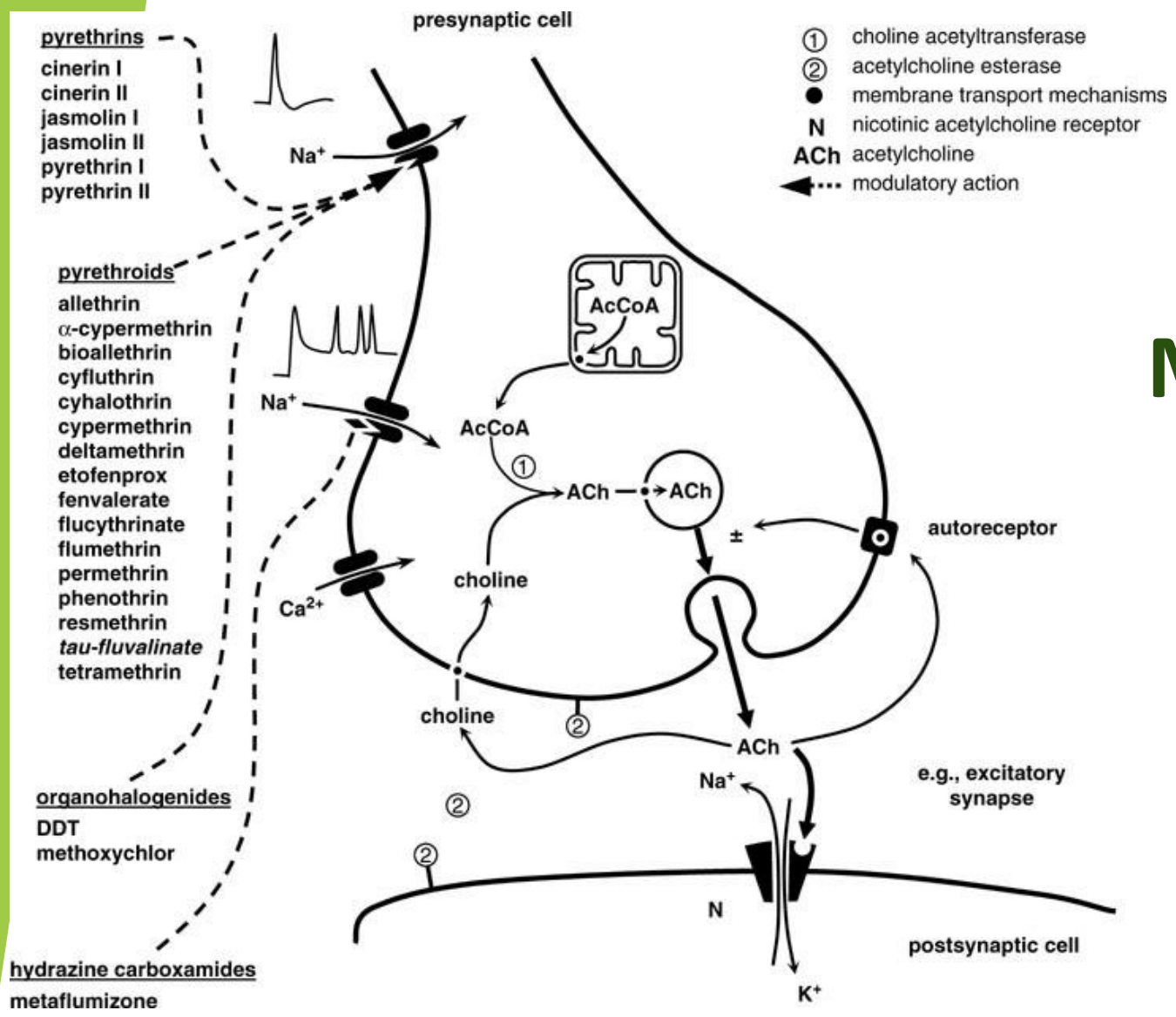
Mansouri, A., Cregut, M., Abbes, C. et al. The Environmental Issues of DDT Pollution and Bioremediation: a Multidisciplinary Review. Appl Biochem Biotechnol 181, 309–339 (2017). https://doi.org/10.1007/s12010-016-2214-5

Mecanismo de ação - Organoclorados



Main proposed mechanisms of action of newer antiepileptic drugs (AEDs) in the inhibitory GABAergic and the excitatory glutamatergic synapse. The black spots are reuptake proteins for GABA and glutamate (two distinct, selective proteins). The grey receptor sites are metabotropic receptors, GABAB for GABA and mGluR, for glutamate. Abbreviations: SV2A: synaptic vesicle protein 2A, the specific binding site for levetiracetam; VGCC and VGSC are voltage-gated calcium- and sodium channels, respectively. (Modified from Johannessen Landmark, 2007).

Modifications of Antiepileptic Drugs for Improved Tolerability and Efficacy
Cecilie Johannessen Landmark, Svein I. JohannessenFirst Published February 14, 2008 Research Article
https://doi.org/10.1177/1177391X0800200001



Mecanismo de ação - Organoclorados

Mehlhorn, Heinz. “Ectoparasiticides - Blockers/Modulators of Voltage-Gated Sodium Channels", Book Title: Encyclopedia of Parasitology, 2008, Springer Berlin Heidelberg, Heidelberg, pages 432-438 ISBN 978-3-540-48996-2, https://doi.org/10.1007/978-3-540-48996-2_1000

https://toxtutor.nlm.nih.gov/14-004.html

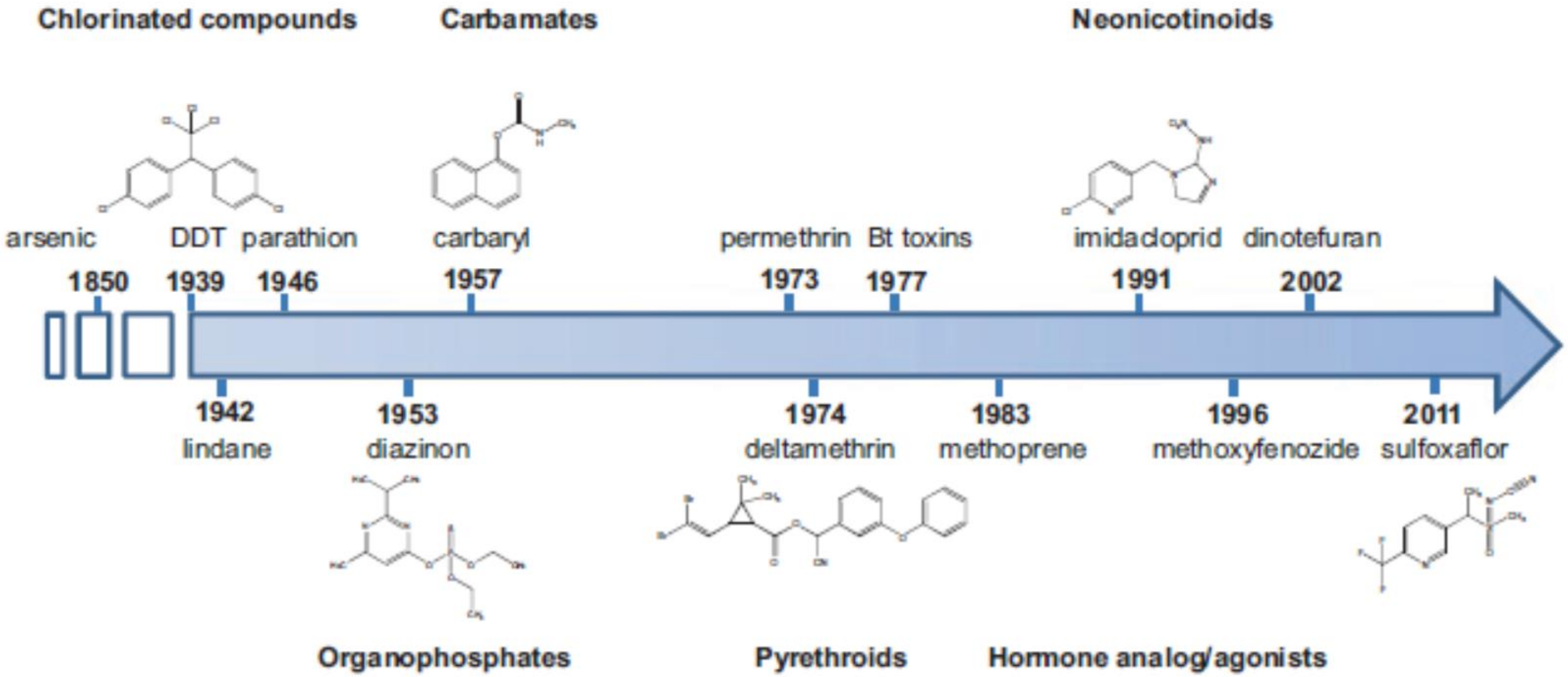


Fig. 3.1 Dates for the discovery of the main classes of insecticides with some important molecules

Cite this chapter as: Le Goff G., Giraudo M. (2019) Effects of Pesticides on the Environment and Insecticide Resistance. In: Picimbon JF. (eds) Olfactory Concepts of Insect Control - Alternative to insecticides. Springer, Cham. https://doi.org/10.1007/978-3-030-05060-3_3

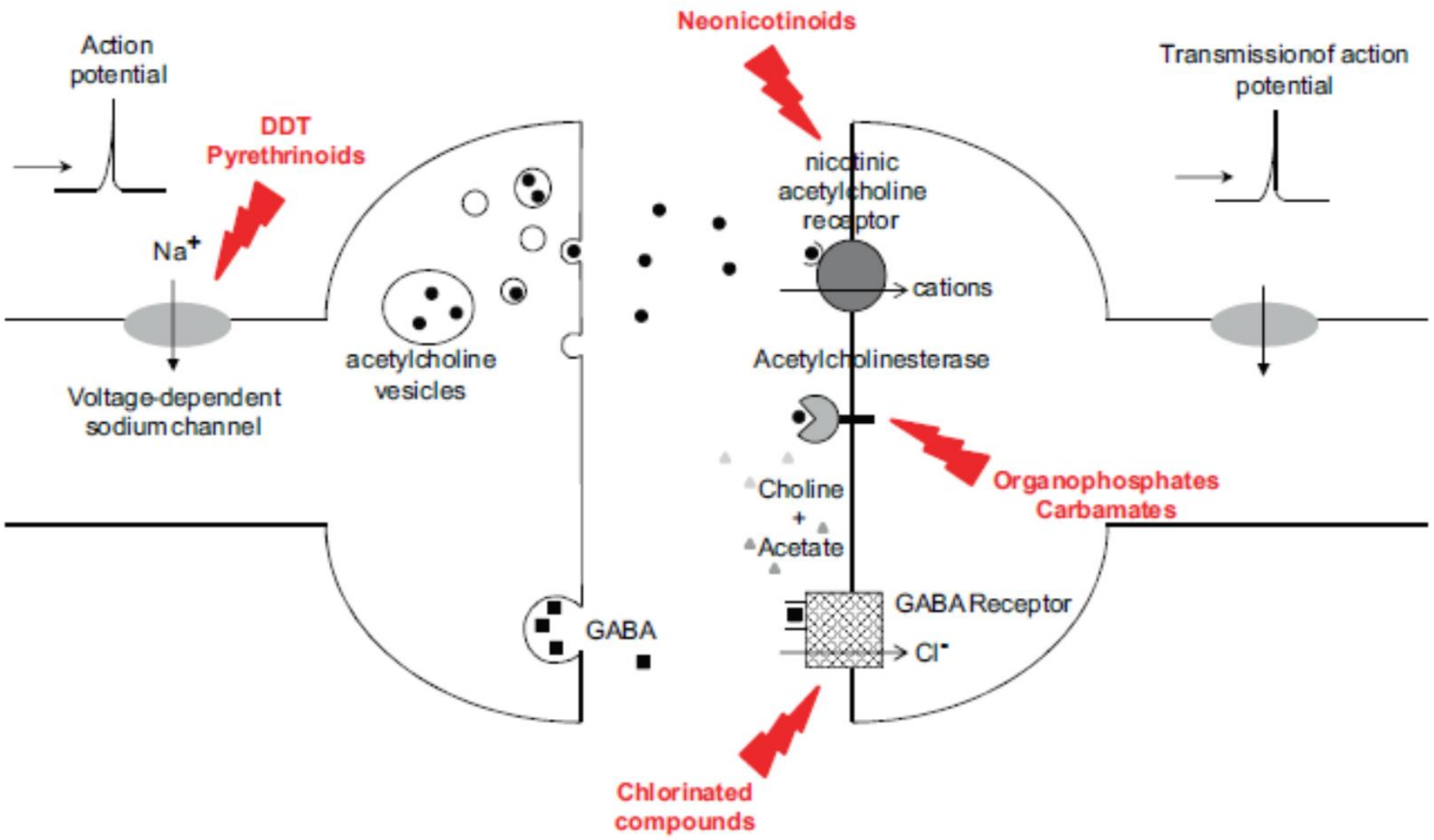
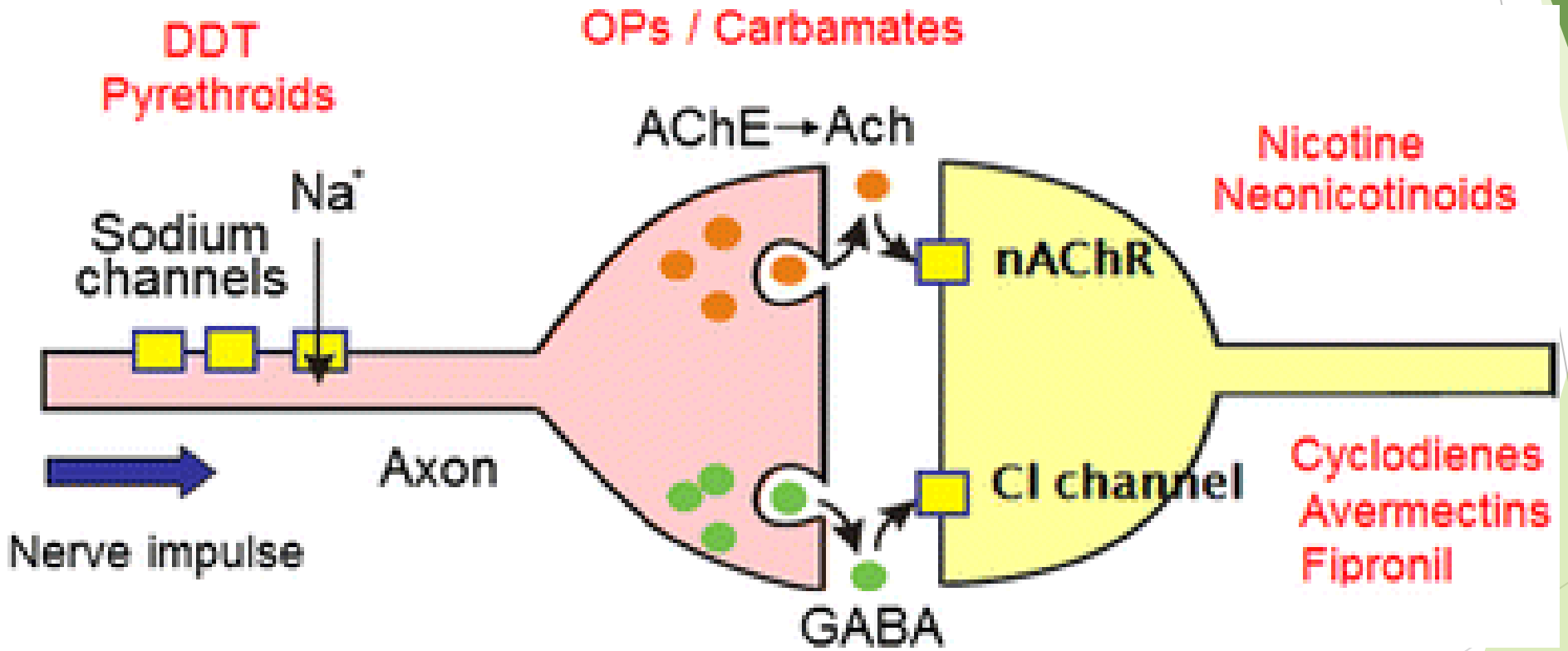


Fig. 3.2 Main targets of insecticides at a synapse

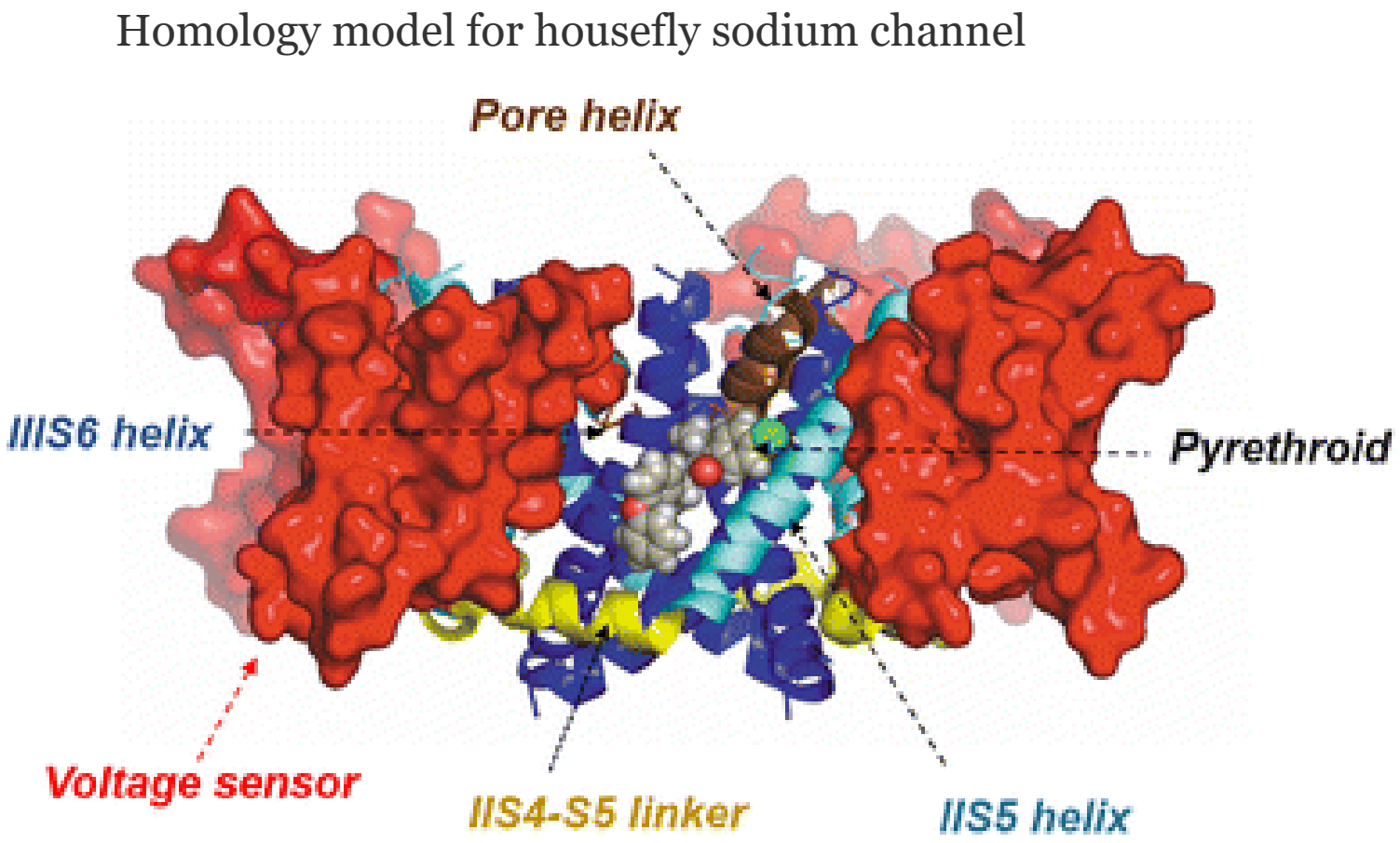
Cite this chapter as: Le Goff G., Giraudo M. (2019) Effects of Pesticides on the Environment and Insecticide Resistance. In: Picimbon JF. (eds) Olfactory Concepts of Insect Control - Alternative to insecticides. Springer, Cham. https://doi.org/10.1007/978-3-030-05060-3_3

From: Voltage-gated sodium channels as targets for pyrethroid insecticides. Fig. 1 Diagrammatic representation of two neurons and an intervening synapse, showing the sites of action of the most commonly used classes of insecticide



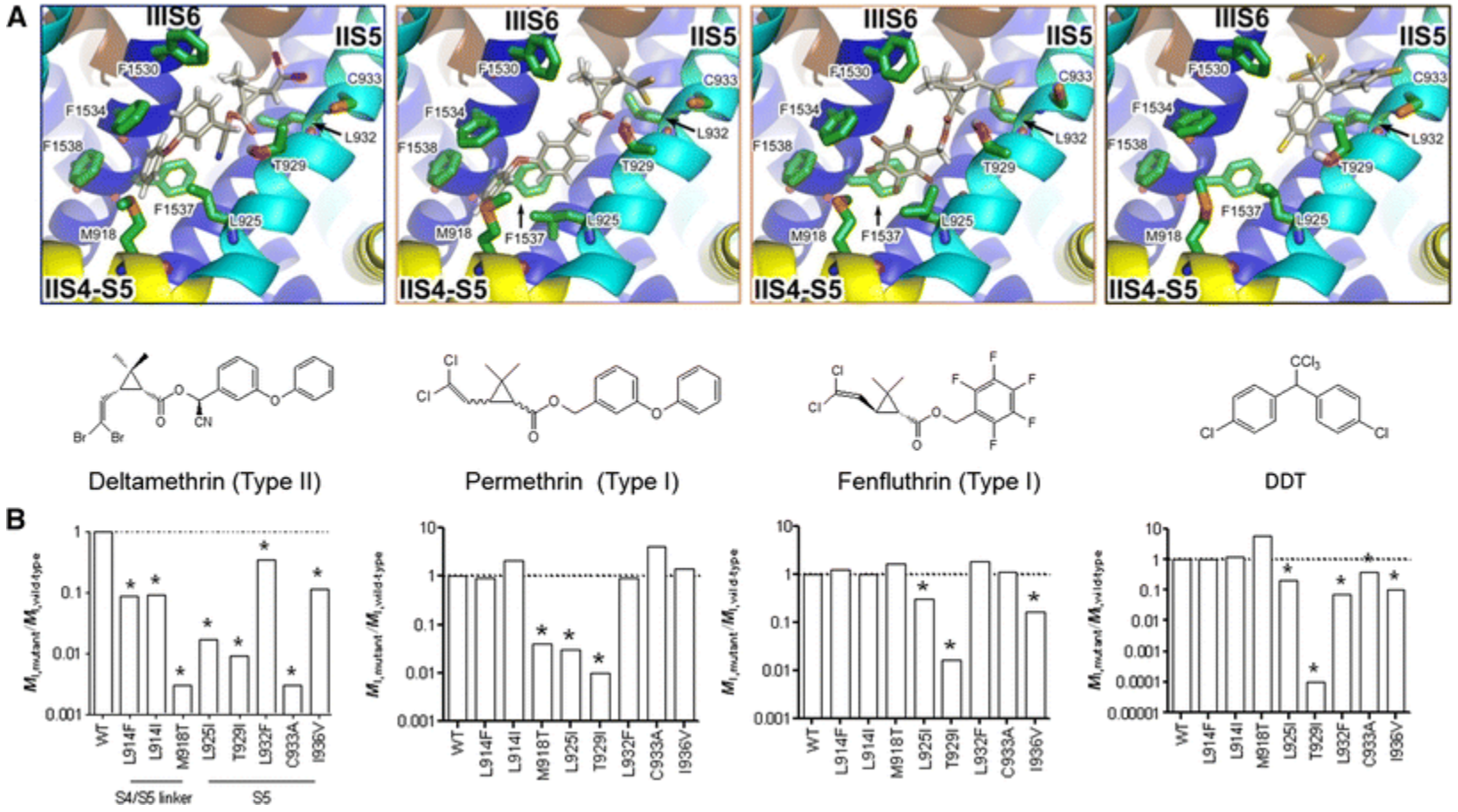
Field, L.M., Emyr Davies, T.G., O'Reilly, A.O. et al. Voltage-gated sodium channels as targets for pyrethroid insecticides. Eur Biophys J 46, 675–679 (2017). https://doi.org/10.1007/s00249-016-1195-1

From: Fig. 2 Voltage-gated sodium channels as targets for pyrethroid insecticides

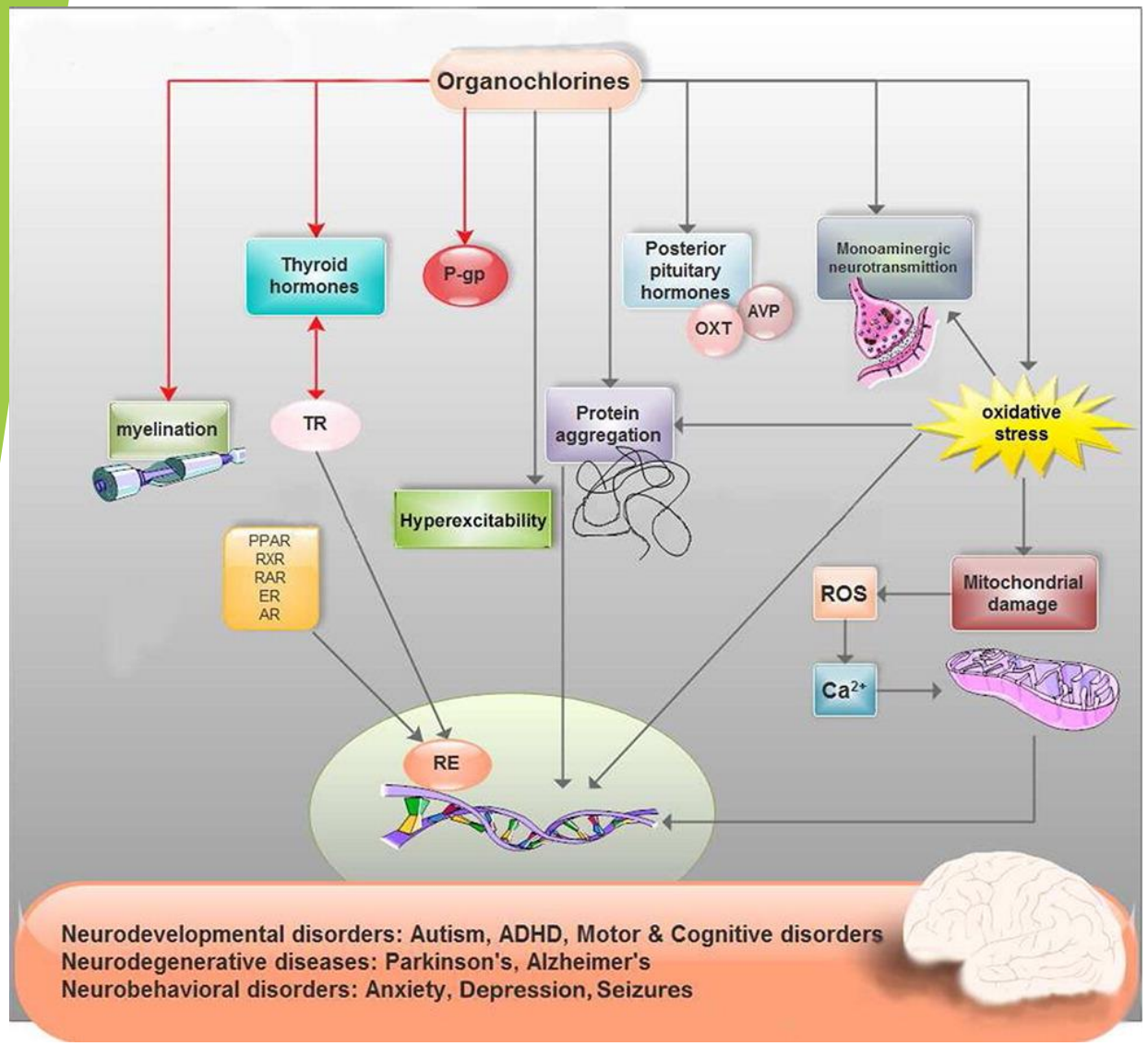


Field, L.M., Emyr Davies, T.G., O'Reilly, A.O. et al. Voltage-gated sodium channels as targets for pyrethroid insecticides. Eur Biophys J 46, 675–679 (2017). https://doi.org/10.1007/s00249-016-1195-1

From: Fig 3. Predicted binding of three pyrethroids and DDT to the binding site of the VGSC adapted from Usherwood et al. (2007) and the effect of amino acid substitutions on the binding of three pyrethroids and DDT to VGSCs expressed in oocytes.



Field, L.M., Emyr Davies, T.G., O'Reilly, A.O. et al. Voltage-gated sodium channels as targets for pyrethroid insecticides. Eur Biophys J 46, 675–679 (2017). https://doi.org/10.1007/s00249-016-1195-1



From: Fig. 1. A schematic model for mechanisms by which organochlorine pesticides induce and develop neurological disorders. ROS: reactive oxygen species, OXT: Oxytocin, AVP: Arginine vasopressin, P-gp: P-glycoprotein, TR: Thyroid receptor, PPAR: Peroxisome proliferator-activated receptor, RXR: Retinoid X receptor, RAR: Retinoic acid receptor, ER: Estrogen receptor, AR: Androgen receptor, RE: response element, ADHD: Attention deficit/hyperactive disorder. Gray arrows: induction, Red arrows: inhibition.

Seyed Soheil Saeedi Saravi, Ahmad Reza Dehpour, Potential role of organochlorine pesticides in the pathogenesis of neurodevelopmental, neurodegenerative, and neurobehavioral disorders: A review, Life Sciences, Volume 145, 2016, Pages 255-264, https://doi.org/10.1016/j.lfs.2015.11.006

Exercícios

- Quais as principais diferenças entre os mecanismos de ação de praguicidas organoclorados dos organofosforados? Cite exemplos e mostre sucintamente os mecanismos envolvidos em cada classe.

- O que é o BHC (lindane)? Como foi usado para combater piolhos em crianças? O DDT também foi utilizado para essa finalidade? Cite referências desses casos e consequências.

- Procure sobre o livro Silent Spring (Primavera Silenciosa), escrito pela escritora Rachel Carson. Qual o ativo mencionado no livro? Resuma sucintamente o que aconteceu nos EUA após o uso desse ativo.

- Assista ao vídeo do link abaixo, veiculado pelo Reporter ECO TV Cultura.

https://www.youtube.com/watch?v=dDeqLDr1oZs

Com base no vídeo, responda: O DDT ainda é usado? Para combater qual praga? Quando foi banido do Brasil? Qual doença neurodegererativa pode estar associada ao DDT?

- Assista ao vídeo https://www.youtube.com/watch?v=h4ugnIHlF-Y

Com base no vídeo, responda: o que acontece com o DDT no ambiente? O desenho aponto como principal problema do DDT e acúmulo nos organismos? Qual o problema para aves?