Pesticide-contaminated eggs, Are they really dangerous?

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Controversy at 2017

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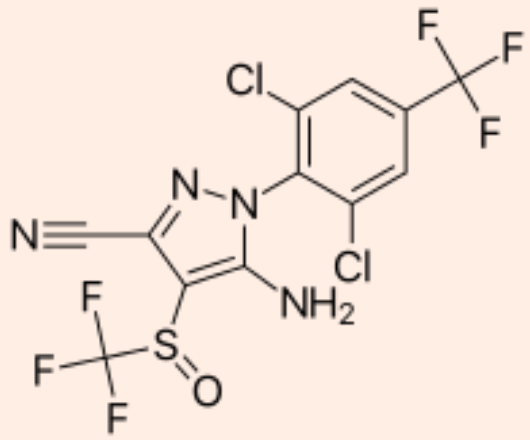
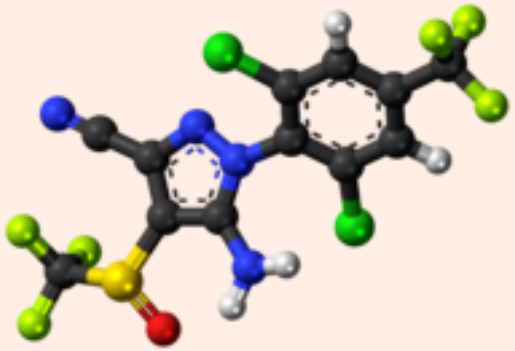
Chemical property



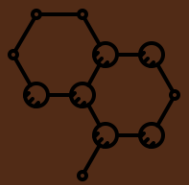


Chemical formula
$C_{12}H_4Cl_2F_6N_4OS$

Density
1.477-1.626 g/cm^3

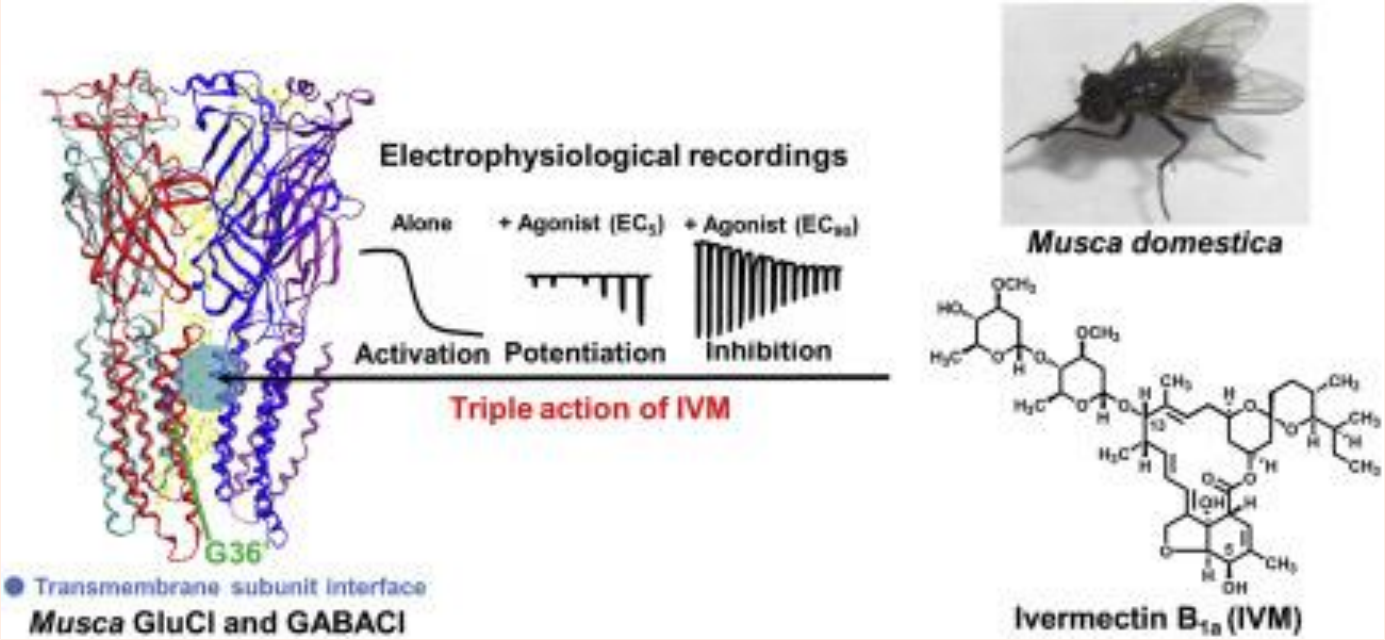
Melting point 200.5 ℃

(RS)-5-Amino-1-[2,6-dichloro-4-(trifluoromethyl)phenyl]-4-(trifluoromethylsulfinyl)pyrazole-3-carbonitrile

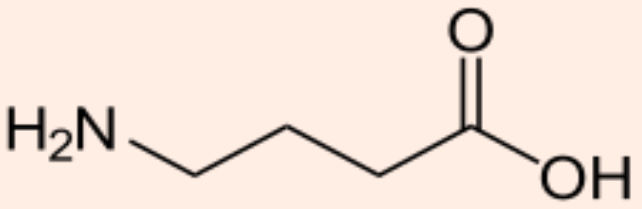



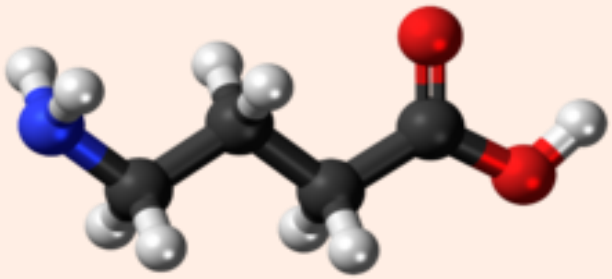

1. Fipronil
Biological characteristics

Glutamate-gated chloride channels(GLuCl):
Fipronil targets present in insects



GLuCl in Musca



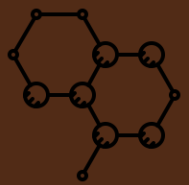


GABA(γ-AminoButyricAcid)

Pipronil acts on the nervous system and blocks GABA and glutamate receptors.

Inhibit signal not generated by blocking
-> signal confused and excitation
-> fully discharged

High effect for insects?
1. high affinity with GABA
2. GLuCl is not in mammals



Toxicity?

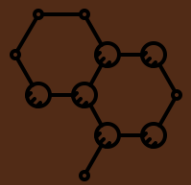
For Human

No Long-term Research on Human body

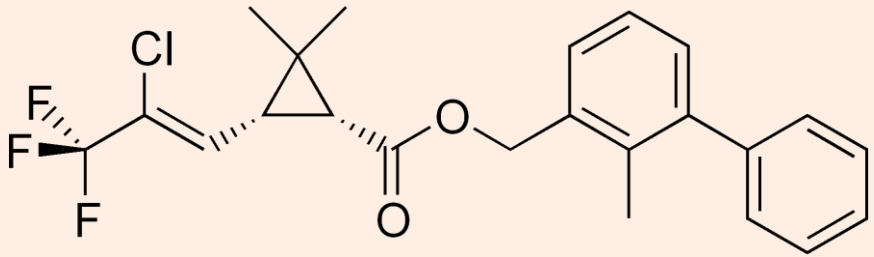
ingestion: accumulation in the body
-> damage to the liver and kidneys

the production and use of chlordane and DDT are strictly limited by the Stockholm convention

classed as a WHO Class II moderately hazardous pesticide


2. Bifenthrin
Chemical property

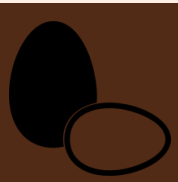
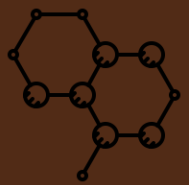


Chemical formula
$C_{23}H_{22}ClF_3O_2$

Density
$1.3 \pm 0.1\ g/cm^3$

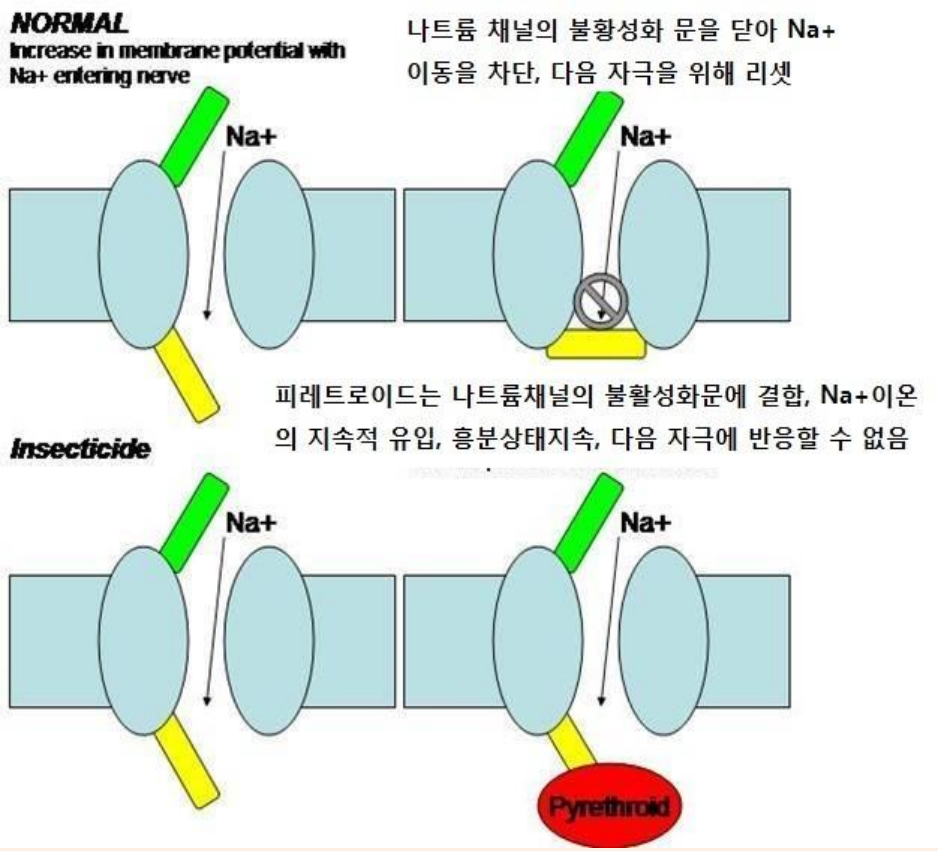
Melting point 79.6 ℃

2-Methyl-3-phenylphenyl)methyl (1*S*,3*S*)-3-[(*Z*)-2-chloro-3,3,3-trifluoroprop-1-enyl]- 2,2-dimethylcyclopropane-1-carboxylate


2. Bifenthrin
Biological characteristics

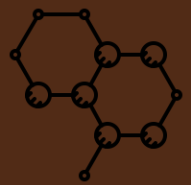
Famous for fire ant repellent



based on the affinity to the voltage-gated **sodium channels**

Type 1
Temporary combination and separation -> keep excitation

Type 2
open the sodium-channel permanently -> keep depolarized


Low effect for mammals?

mammals' higher body temperature, larger body size, and enough degrading enzymes

lower bifenthrin-sodium channel affinity than insects

only cats among vertebrates do not have glucuronidase(degrading enzyme)
-> High effect for cats

Toxicity?

For Human

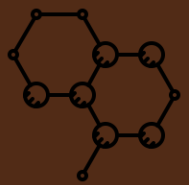
there are chronic toxicity, endocrine disruption in study, HOWEVER no human data were found

skin contact: itchy, prickly, tickling
ingestion: vomiting, diarrhea, headache

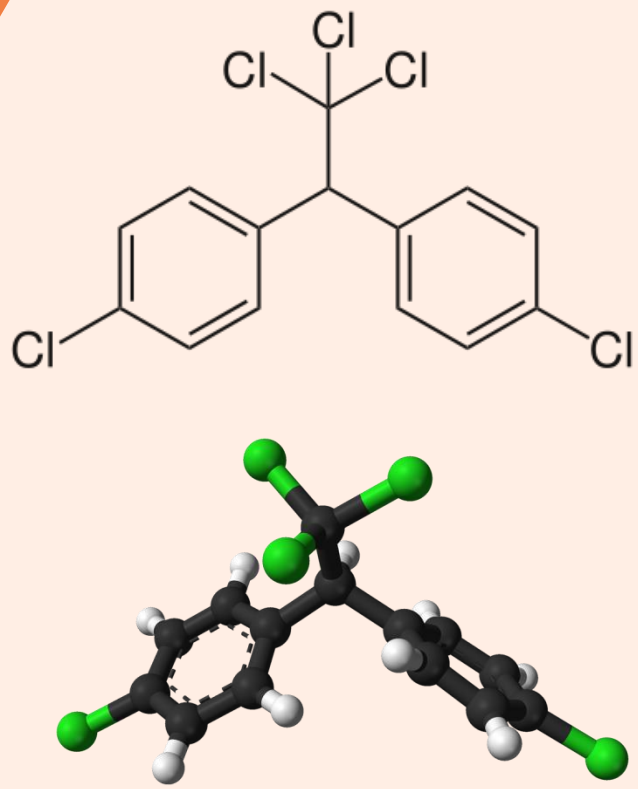
Carcinogen

the U.S. EPA classified bifenthrin as a Group C, possible human carcinogen

Group C - Possibly Carcinogenic to Humans: Agents with limited animal evidence and little or no human data



3. DDT (Dichloro-Diphenyl-Trichloroethane)
Chemical property

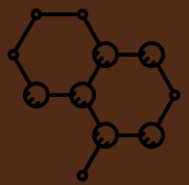


Chemical formula
$C_{14}H_9Cl_5$

Density
0.99 g/cm^3

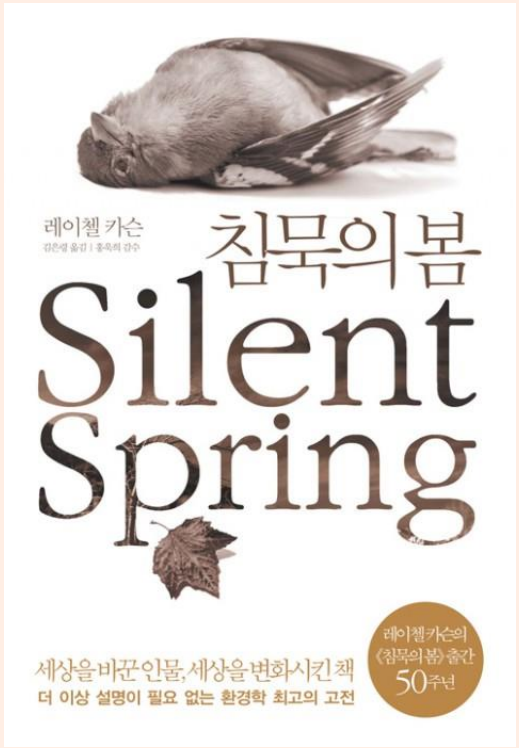
Melting point 108.5 ℃

1,1'-(2,2,2-Trichloroethane-1,1-diyl)bis(4-chlorobenzene)


3. DDT (Dichloro-Diphenyl-Trichloroethane)
Biological characteristics

The most famous insecticide



Published in 1962

Paul Hermann Müller won the Nobel prize in Physiology or Medicine in 1948 for his discovery of the high efficiency of DDT

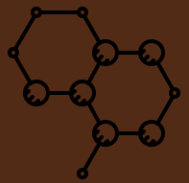
Rachel Carson introduced DDT's harm to Reader's Digest

HOW does DDT kill insects?

bind to open sodium channels and stabilize the open state

DDT opens sodium ion channel in neurons, causing them to fire spontaneously, which leads to spasms and eventual death

used to kill Pediculus(이), but limited in 1986



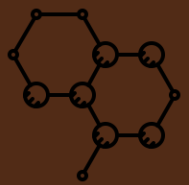
carcinogen?

Toxic

DDT is WHO IARC Group 2-A

WHO IARC Group 2-A: **Probably carcinogenic to humans**

Other WHO IARC Group 2-A: Very hot beverages (above 65 degrees Celsius), Red meat,



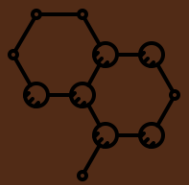
Harmfulness?

Why are carbon compounds dangerous?

In human's body, The action of several enzymes is important

must be digested what we ate

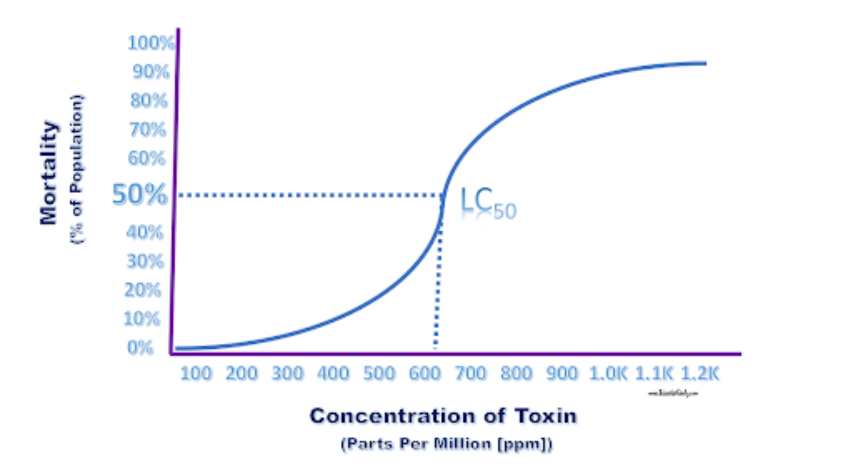
Halogen-free in human's body



HOW about the eggs?

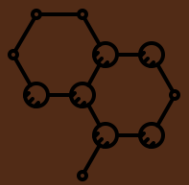
DANGEROUS but..

1. very high lethal dose



Shows LD50

Fipronil – 97mg/kg
Bifenthrin – 70mg/kg
DDT – 113mg/kg

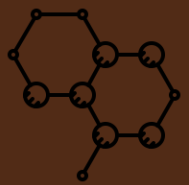

DANGEROUS but..

2. small amount in the egg

In Korea..

Fipronil – 0.272mg/kg
Bifenthrin – 0.272mg/kg
(Maximum detected value)

The biggest egg is 70mg(0.07kg)

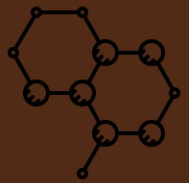




NOT proven to be harmful to humans

High threshold

JUST eat!

HOWEVER, the unpleasant..??



Citation

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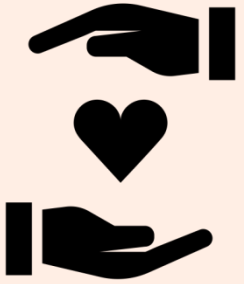

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