NEUROPHYSIOLOGY

# Are pesticides safe to use with proper protections?

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Pesticides are handy in day to day life, in order to keep slugs out of the garden bed, or to keep a football field green. While people who only use pesticides once or twice a year may not notice negative effects, do people who regularly use pesticides notice detrimental effects? While many pesticides are deemed safe for human contact under safety procedures, as time passes, more and more pesticides are being considered unsafe, even under safety procedures.
A recent study done by Lee at al., discusses that when pesticides are used in an outside location they can easily contaminate inside buildings[1]. Not only can pesticides be tracked into human living quarters, but pesticides can also make their way into rivers and affect animal habitats. Pesticides can be a danger to both humans and animals.

Certain classes of pesticides are designed to kill pests by causing mitochondrial dysfunctions. Mitochondria are the 'powerhouse of the cell' so they are vital for cell function. Since pests are small most can be killed at a much smaller dose than humans. While a small dose due to the pesticide moving inside may not cause a large effect, the small effect can build up over time.
Deltamethrin is pesticide that is derived from chrysanthemums and therefore a natural pesticide[2]. While deltamethrin is deemed to be a safe pesticide, a review written by Lu et al., insinuates that deltamethrin may have dangerous effects on mitochondrial function, even as far as leading to Parkinson's Disease. This is not the only pesticide that has been connected to Parkinson's Disease. For example, two pesticides that were once commonly used, rotenone and paraquat, are now being used in Parkinson's Disease models due to their damage to the mitochondria.
The study specifically looked at the epidemiology of deltamethrin on various wildlife. Deltamethrin induced symptoms such as "Oxidative DNA damage" (in rainbow trout[3], carp[4]), "increased carbonyl levels" (In freshwater fish[5]), "DNA Fragmentation'' (in Male albino rats[6]), and "DNA damage" (Female Wistar Rats[7]).

Deltamethrin has been shown to activate the P66SHC pathway, which is connected to Reactive Oxygen Species (ROS). Figure 1 illustrates the biological pathway that deltamethrin activates. Deltamethrin increases the activity of P66SHC by phosphorylation. The P66SHC pathway increases ROS by moving into the mitochondria, then interacting with cytochrome C[8]. Cytochrome C then acts to increase ROS production. ROS are dangerous to the cell since they can cause DNA damage, and apoptosis[9].

While deltamethrin may not have a deadly effect in a small dosage, people who are constantly exposed to pesticides, such as farmers, may be at risk. Farmers would not have an opportunity to decrease their exposure time, especially if the pesticide were to be deemed safe. People outside of the science community do not scour the information on a can of pesticide. Safety is not always the first concern of people, allowing overexposure to occur.

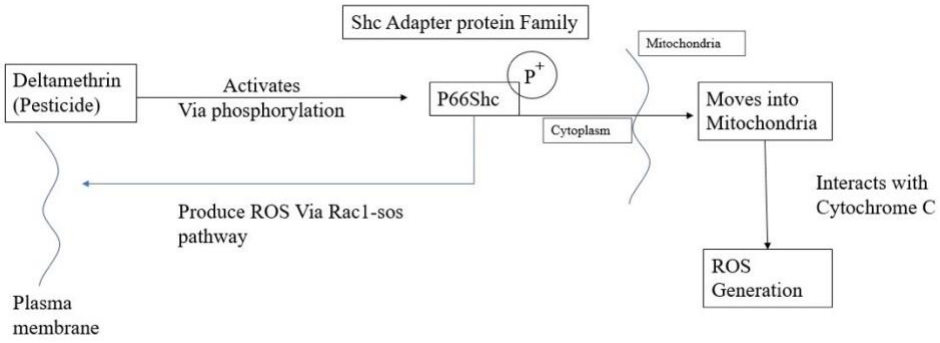


**Figure 1.**

It is vital to determine if deltamethrin is safe for reoccurring use. It is also important to stop laypeople from misusing pesticides. While pesticides can decrease disease and pests while increasing crop yield, they are currently dangerous for humans and wildlife.

## REFERENCES


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