



# Inhibitory Effect of Glyphosate on Butyrylcholinesterase and Acetylcholinesterase Activity

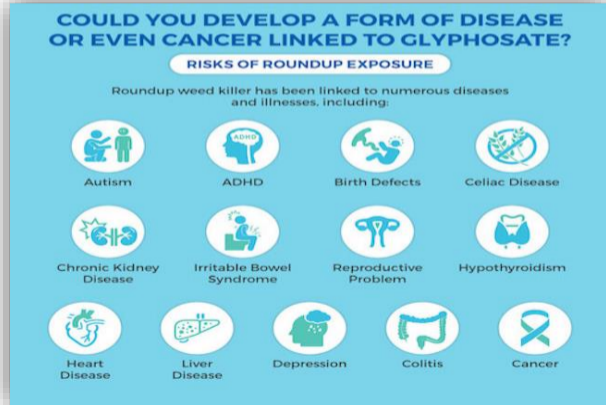
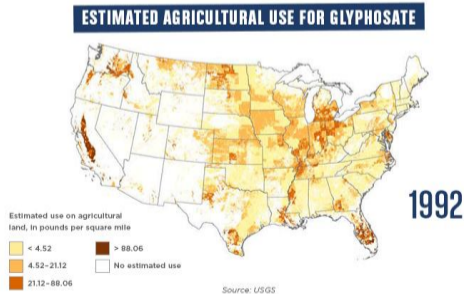
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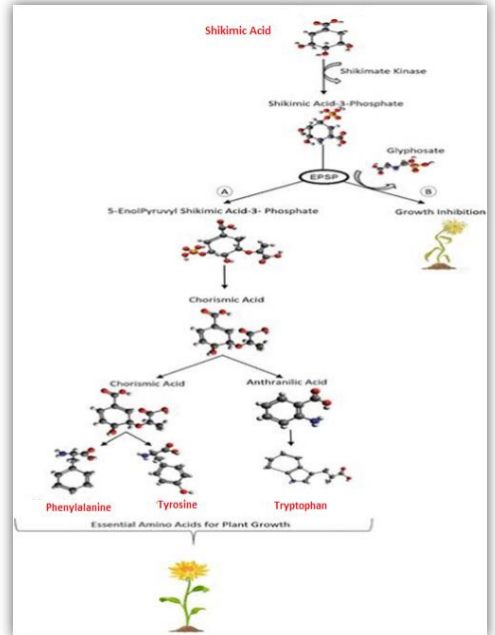
# Glyphosate Usage and Its effects on Health

- Herbicide glyphosate (N-phosphonomethyl glycine) began to be used in 1974 for weed control in agricultural production areas.



# Glyphosate Metabolism

- This pathway is found in plants, fungi, and bacteria, but not in our genes.



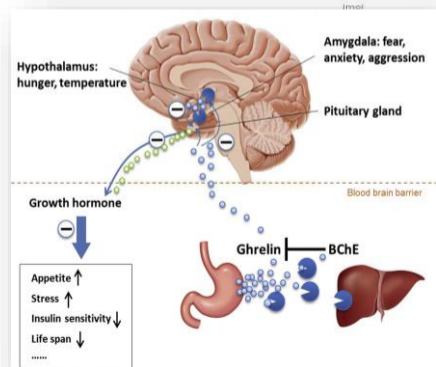
# Acetylcholinesterase and Butyrylcholinesterase

- **Acetylcholinesterase** (AChE, EC 3.1.1.7) and **butyrylcholinesterase** (BChE, EC 3.1.1.8) are serine hydrolase enzymes that catalyze the hydrolysis of acetylcholine.
- **Acetylcholinesterase** (AChE) is one of the most crucial enzymes for nerve response and function. AChE catalyzes the hydrolysis of acylcholine esters with a relative specificity for acetylcholine.



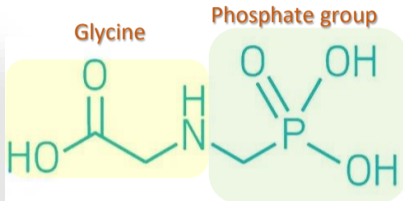
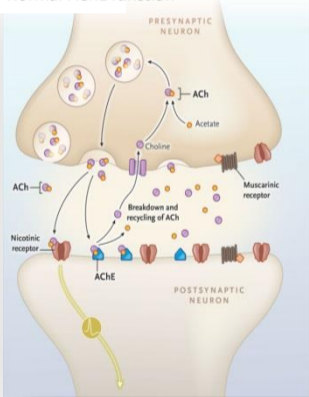
# Acetylcholinesterase and Butyrylcholinesterase

- The **butyrylcholinesterase** is found in mammalian blood plasma, liver, pancreas, intestinal mucosa and the white matter of the central nervous system.
- It hydrolyzes butyrylcholine 4 times more rapidly than acetylcholine. The enzyme is more active with butyryl and propionyl choline than with acetylcholine.

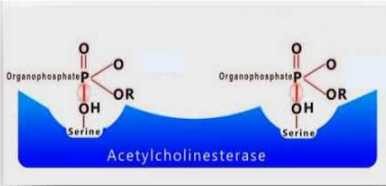


# Cholinesterase Inhibition of Organophosphate

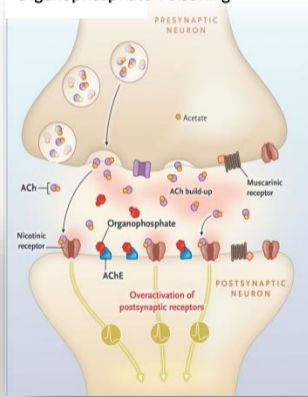
Normal AChE function



## Glyphosate



Organophosphate Poisoning



# Material and Methods

HUMAN VENOUS BLOOD (2mg/ml Na<sub>2</sub>EDTA)

Plasma

Erythrocyte Pellet

↓ ↻ **Glyphosate**

BChE activity (U/mL)

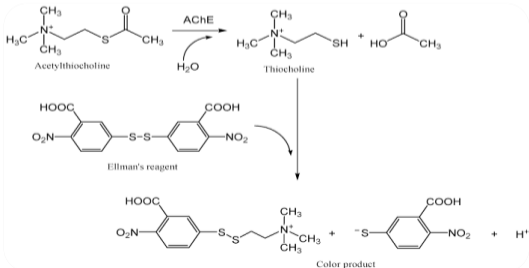
↓

Hemolysate

↓ ↻ **Glyphosate**

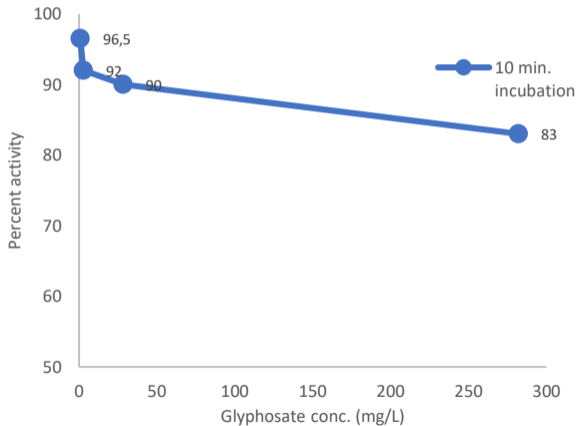
AChE activity (U/gHb)

↙

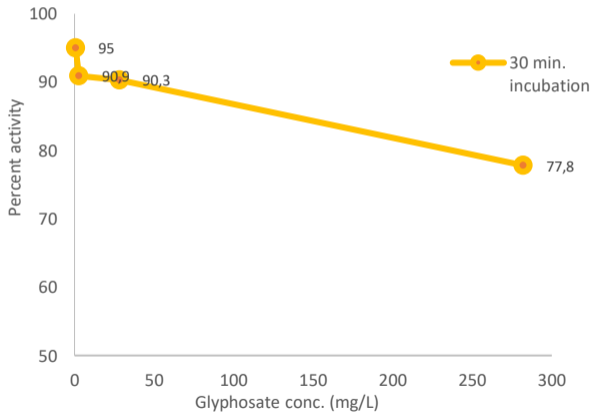


# Results

## Plasma Cholinesterase Activity



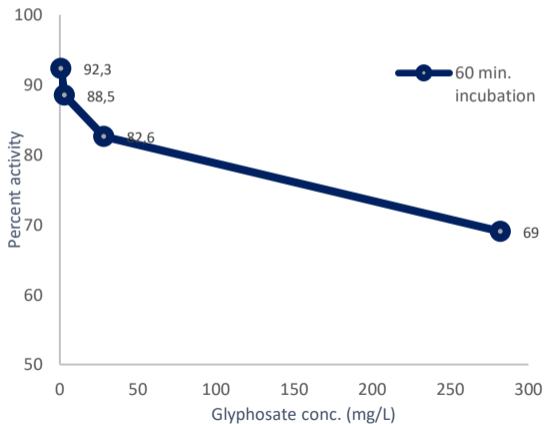
## Plasma Cholinesterase Activity



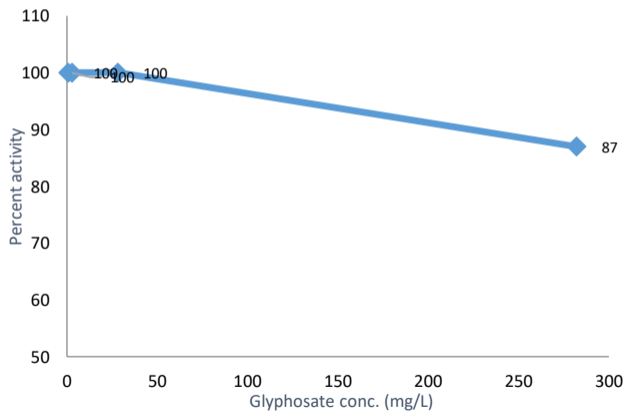


# Results

## Plasma Cholinesterase Activity



## Acetylcholinesterase Activity





- ➡ Consequently some articles have controversial statements about the inhibition of glyphosate on cholinesterases.
- ➡ We investigated the interaction of both enzymes with glyphosate *in vitro* conditions. An inhibition of glyphosate was observed in these enzymes.
- ➡ Inhibition of acetylcholinesterase was achieved with a high concentration of glyphosate, but no time-dependent inhibition was observed.
- ➡ Contrary inhibition of butyrylcholinesterase with glyphosate was observed at each concentration and inhibition increased as the exposure time increased.
- ➡ It has been concluded that prolonged exposure to glyphosate may cause pathological findings.



*Thank You for Participation.*