Statistical Analysis: Survival and Morphological Abnormalities Due to Exposure of Organophosphate Pesticides in Zebrafish Embryos

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Statistics MATH 080 Final Project

Background/Definitions

Neurotransmitter : Chemical messengers that relay chemical messages between neurons or from neurons to muscle cells.

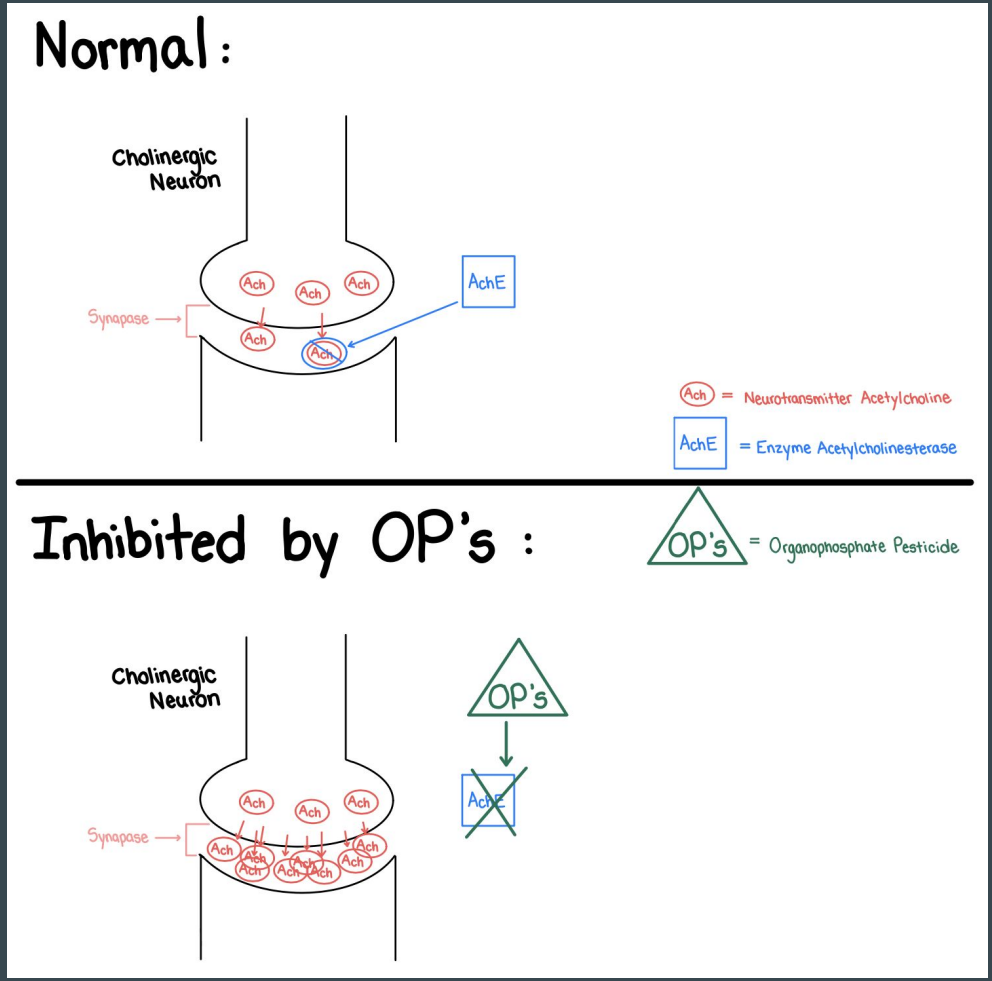
Cholinergic Neuron: A nerve cell that sends messages via the neurotransmitter acetylcholine.

Synapse: The space between two nerve cells (neurons) where neurotransmitters are passed

Enzymes : Type of substance in living organisms that act as catalysts (help chemical reactions occur)

Acetylcholinesterase Enzyme: Enzyme at nerve synapses, that breakdown the neurotransmitter acetylcholine.

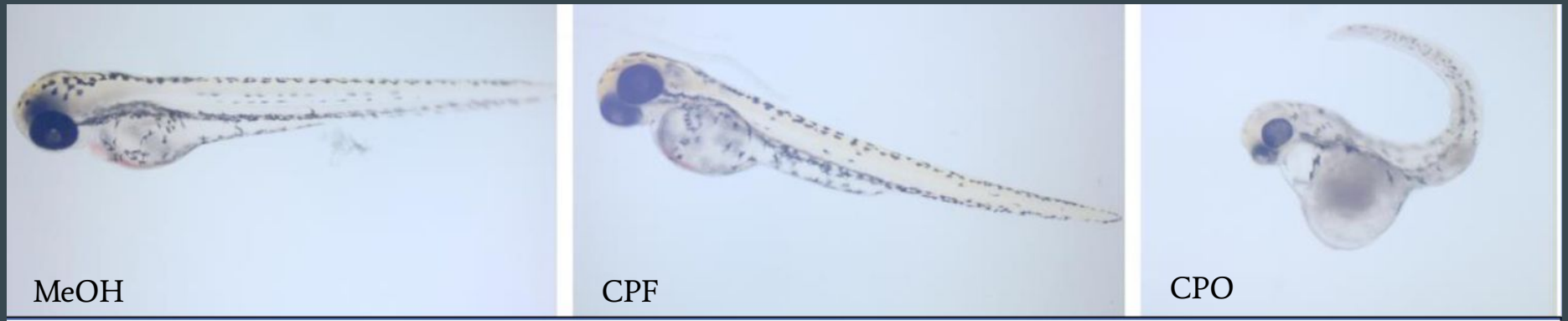
Neurotransmitter Acetylcholine: Chemical found at the synapse released by cholinergic neurons that stimulate muscle contraction, activate the endocrine systems (where hormones are released) along with many other functions.



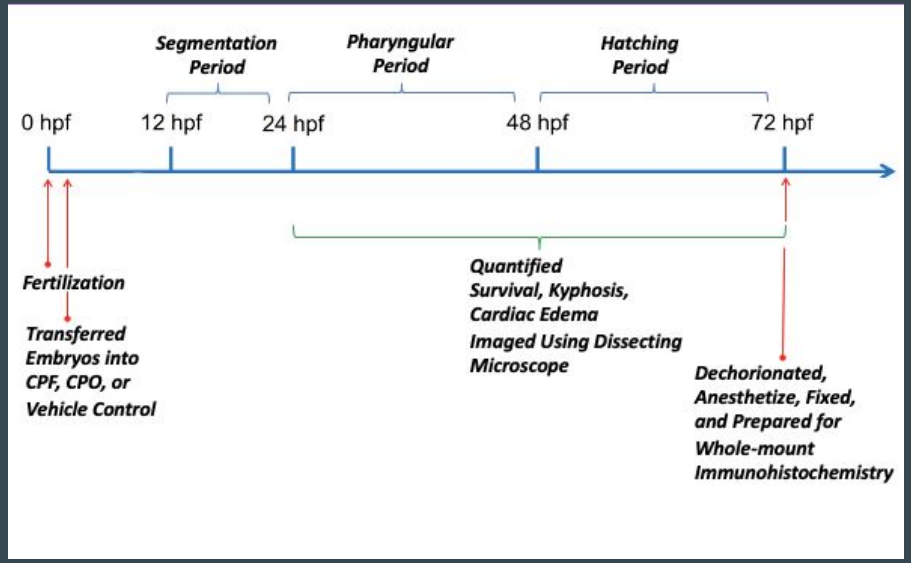
Introduction

OP's : (Chlorpyrifos and Chlorpyrifos-oxon) One of the most widely used pesticides for control of insect pests in agriculture.

GOAL : Produce a linear relationship between the effects of OP's on survival and morphological abnormalities in zebrafish embryos.



Data Collection/ Analysis



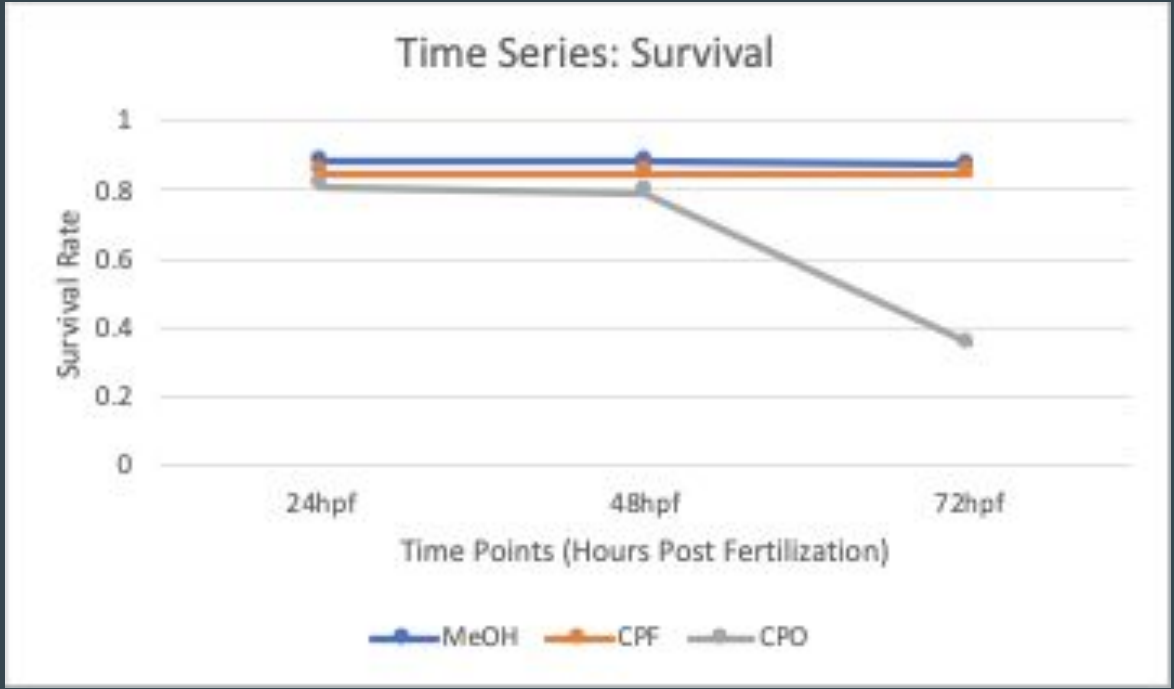
Population: Four tanks of 5 adult zebrafish each

Sample: Embryos collected from 20 adult zebrafish

Variable: Quantitative data- $N_{survival}$ $N_{Kyphosis}$ $N_{Cardiac\ Edema}$

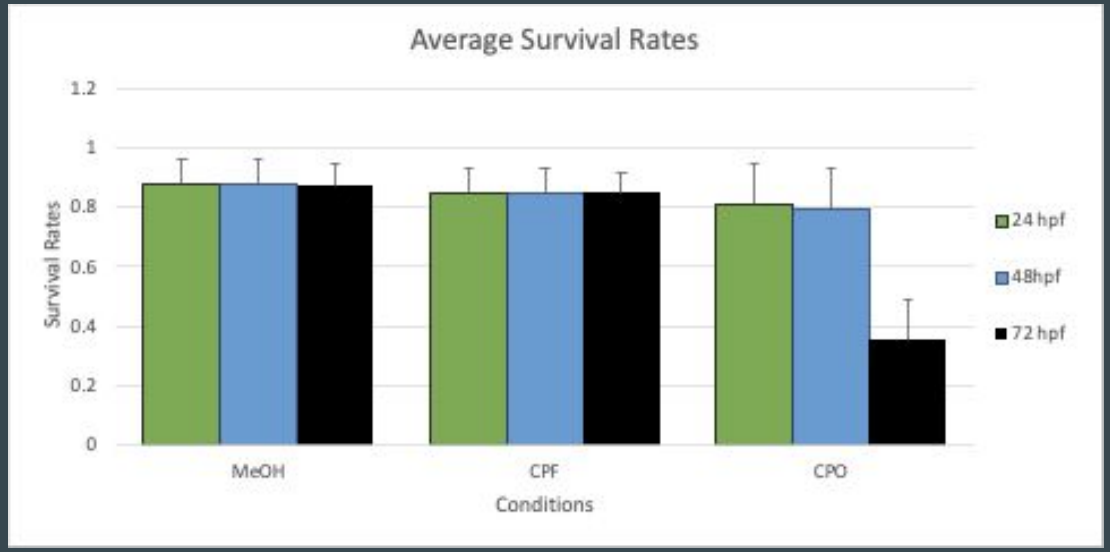
Type of Data: Quantitatively Discrete

Graphical Representation



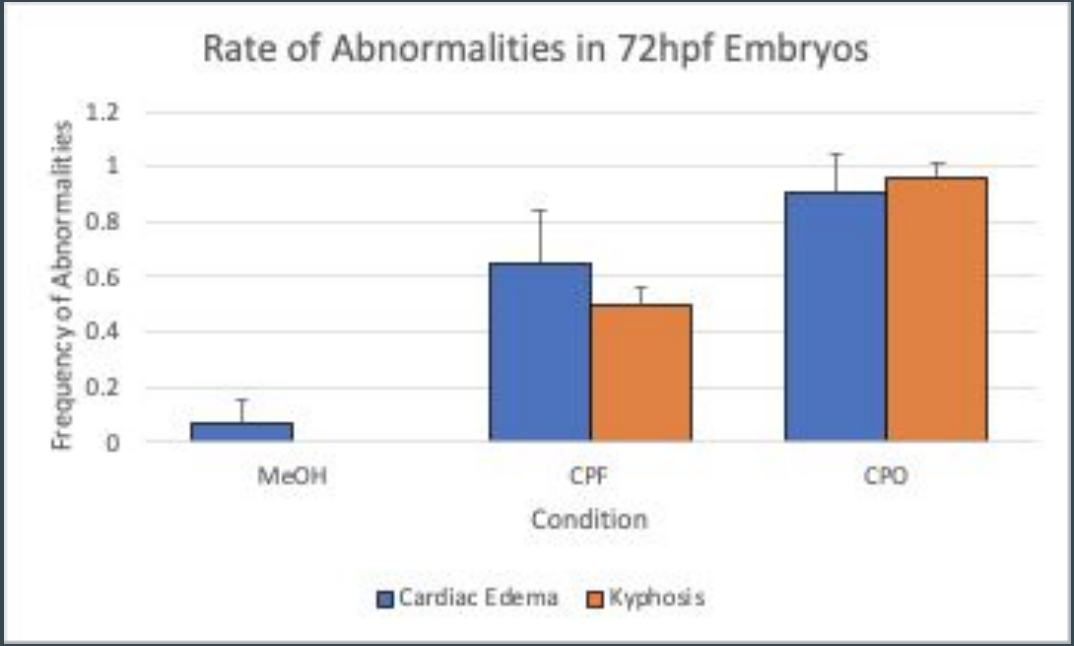
Survival Data

		MeOH	PTU	CPF	CPO
Trial 1:	**24 hpf**	0.85	0.85	0.65	0.9
Trial 2:	**24 hpf**	0.95	0.8	1	0.8
Trial 3:	**24 hpf**	0.9	0.9	0.8	0.85
Trial 4:	**24 hpf**	0.95	1	0.85	0.65
Trial 5:	**24 hpf**	0.75	0.8	0.95	0.85
	Averages:	**0.88**	**0.87**	**0.85**	**0.81**
	Std. Dev. :	**0.083666**	**0.083666**	**0.13693064**	**0.09617692**
Trial 1:	**48 hpf**	0.85	0.85	0.65	0.85
Trial 2:	**48 hpf**	0.95	0.8	1	0.8
Trial 3:	**48 hpf**	0.9	0.9	0.8	0.85
Trial 4:	**48 hpf**	0.95	1	0.85	0.65
Trial 5:	**48 hpf**	0.75	0.8	0.95	0.8
	Averages:	**0.88**	**0.87**	**0.85**	**0.79**
	Std. Dev. :	**0.083666**	**0.083666**	**0.13693064**	**0.08215838**
Trial 1:	**72 hpf**	0.85	0.85	0.65	0.75
Trial 2:	**72 hpf**	0.9	0.8	1	0.5
Trial 3:	**72 hpf**	0.9	0.9	0.8	0.7
Trial 4:	**72 hpf**	0.95	0.95	0.85	0.5
Trial 5:	**72 hpf**	0.75	0.8	0.95	0.45
					0.13
	Averages:	**0.87**	**0.86**	**0.85**	**0.505**
	Std. Dev. :	**0.07582875**	**0.06519202**	**0.13693064**	**0.21988633**



Data represent normalized mean±standard deviation for five independent trials, n=20.

Data of Morphological Abnormalities



72hpf in zebrafish embryos exposed to methanol vehicle control (MeOH), 10 μM chlorpyrifos (CPF), and 1 μM chlorpyrifos oxon (CPO).

Embryos exposed to CPO showed an increase morphological abnormalities including cardiac edema (blue bars) and kyphosis (orange bars).

Data represent normalized mean±standard deviation for five independent trials, n=20.

Conclusions

BAN PESTICIDES.