

Determining Cholinesterase Reference Values

By Brittney Rodgers

Preview

- ▶ Background information
 - ▶ Cholinesterase, organophosphates/carbamates, and reference values
- ▶ Methods and Materials
- ▶ Results
- ▶ Discussion
 - ▶ Trends
 - ▶ Pros and Cons

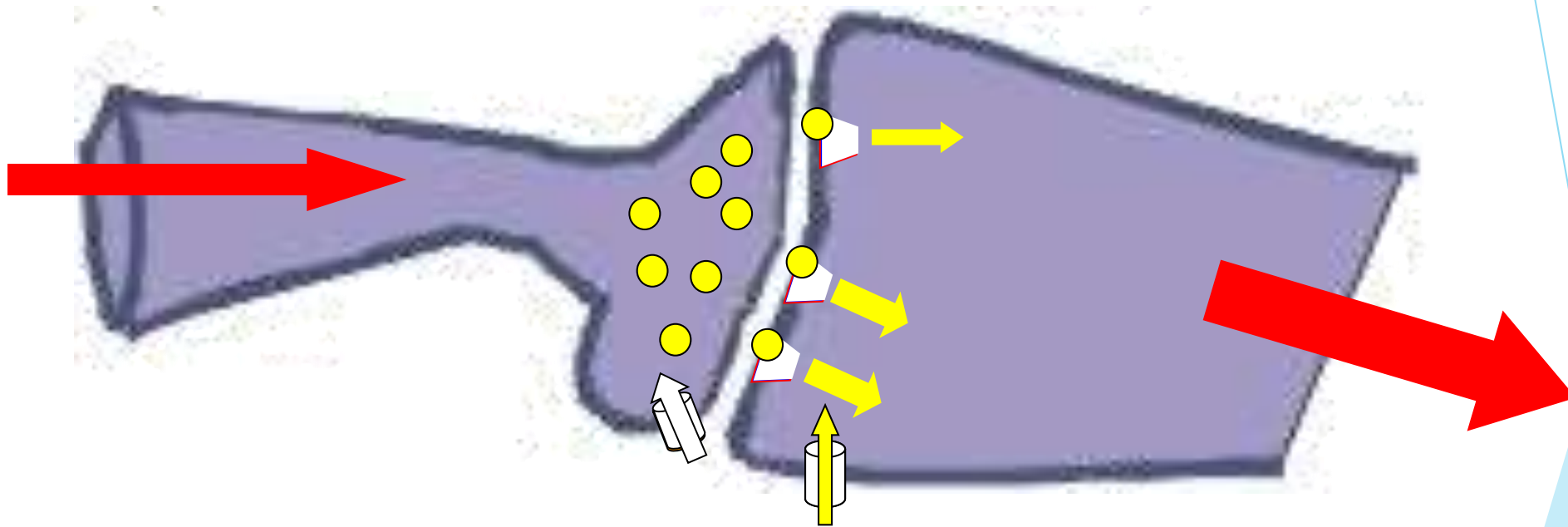
Cholinesterase

- ▶ What is it?
 - ▶ Enzyme
- ▶ What does it do?
 - ▶ Hydrolysis of acetylcholine
- ▶ Why is this important?



Credit RDSB Protein Data Bank

Acetylcholine Mechanism



Credit Dr. Merl Raisbeck

Organophosphates (OP) and Carbamates (CA)

- ▶ Found in insecticides
- ▶ Inhibit Cholinesterase
 - ▶ mechanism
- ▶ Signs of poisoning

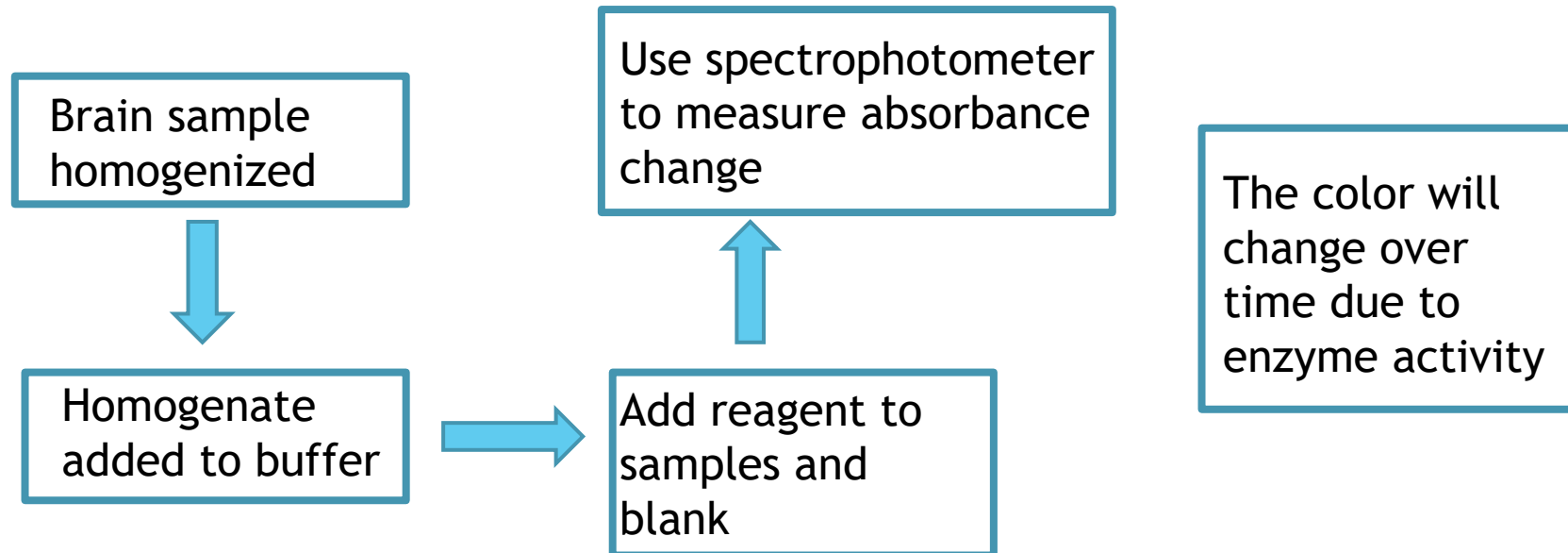


Reference Values

- ▶ Difficult to find OP and CA in body
- ▶ Use cholinesterase activity levels
- ▶ Need to establish reference values
 - ▶ There is a lack of established values for wildlife species

Methods and Materials

- ▶ Samples from the WSVL
 - ▶ Modified Ellman method



Methods and Materials

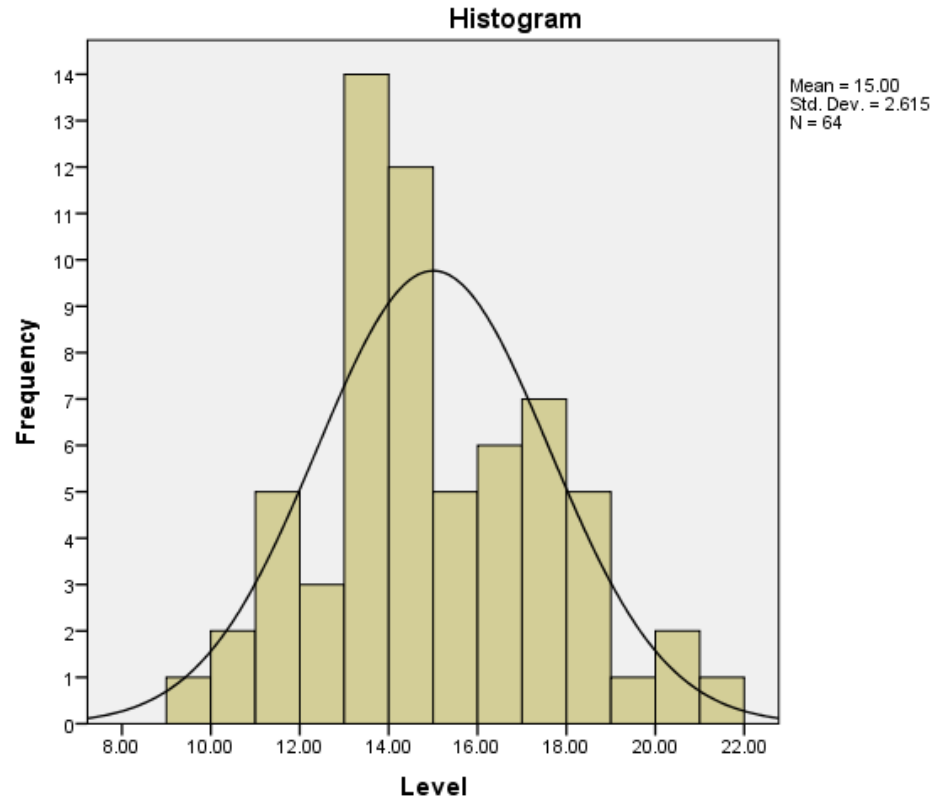
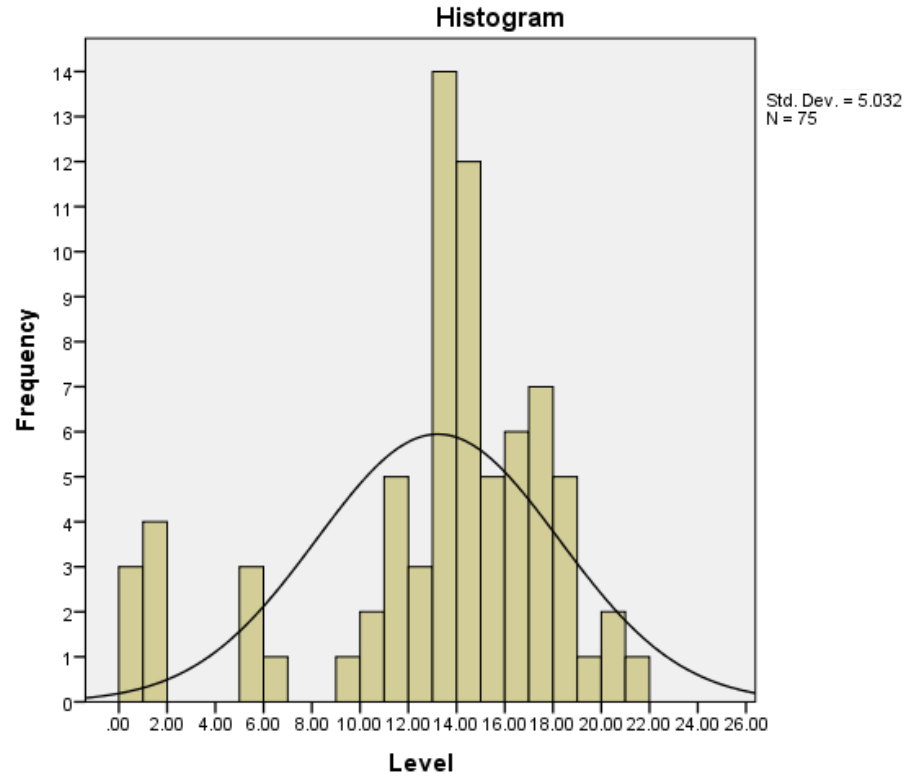
- ▶ Data

- ▶ birds and mammals

- ▶ Analysis

- ▶ Histograms, medians, standard deviations, 95% confidence intervals

Histograms



Golden Eagle with and
without outliers

Results

Species	Body Size (g)	Std. Deviation	Median ($\mu\text{mole/g/min}$)	95% Confidence interval	N
Golden Eagle	3000-6125	2.61	14.61	(9.49, 19.73)	64
Bald Eagle	3000-6300	3.45	14.27	(7.51, 21.03)	52
Sage Grouse	1400-2900	3.66	15.75	(8.58, 22.92)	22
Trumpeter Swan	7700-12700	4.76	15.1	(5.74, 24.46)	22
Red-tailed Hawk	M: 690-1300 F: 900-1460	3.21	16.5	(10.21, 22.79)	18
Great Horned Owl	910-2500	2.47	17.6	(12.76, 22.44)	18
Pheasant	500-3000	1.05	13.25	(11.19, 15.31)	6
Prairie Falcon	420-1100	0.87	25.7	(23.99, 27.41)	5
Swainson's Hawk	693-1364	1.11	16.17	(13.99, 18.35)	5

Results

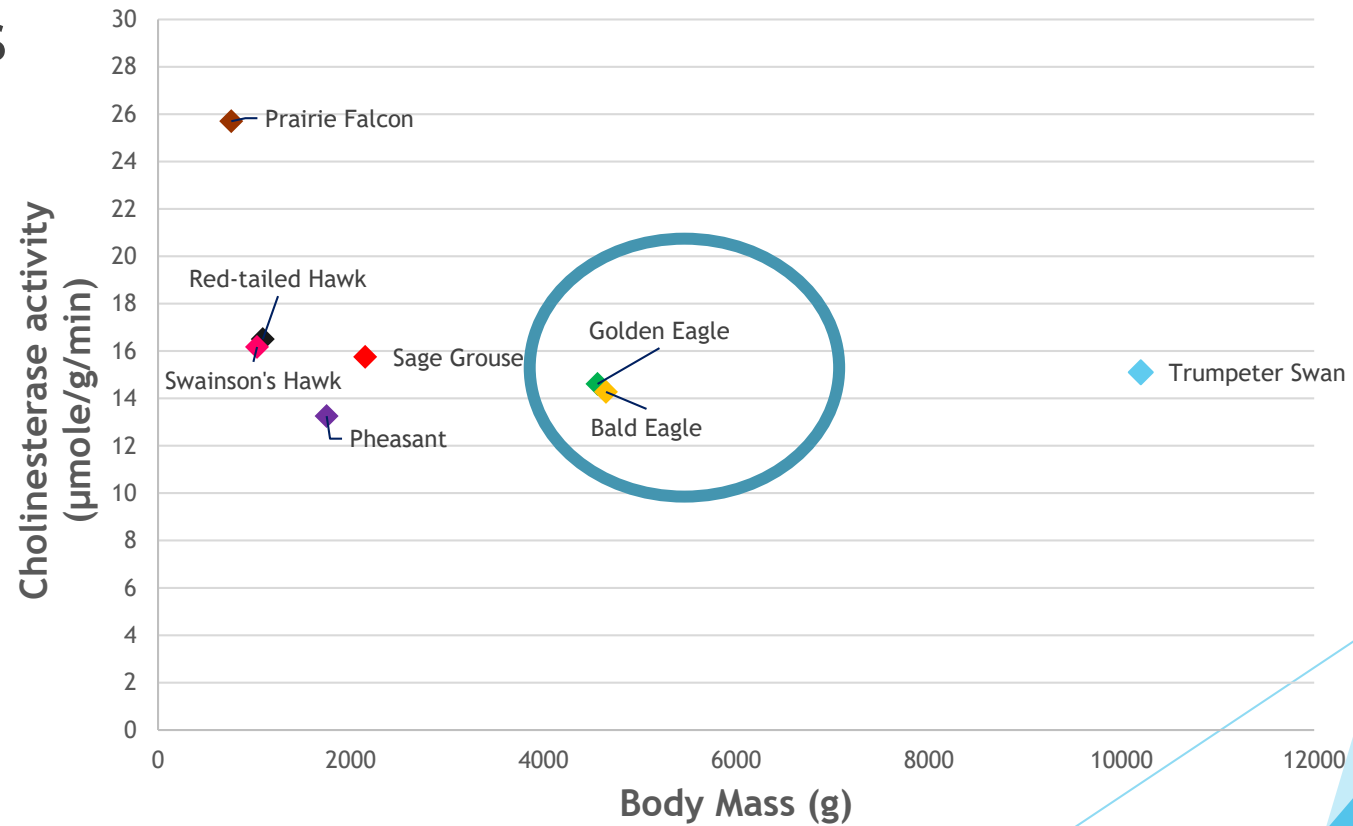
Species	Body size (kg)	Std. Deviation	Median ($\mu\text{mole/g/min}$)	95% Confidence interval	N
Cattle	640-1090	1.75	3.35	(0, 6.78)	75
Dog	1-91	1.75	3.70	(0.27, 7.13)	67
Prairie Dog	1-2	2.09	12.15	(8.05, 16.25)	22
Pronghorn	41-68	1.63	5.04	(1.85, 8.23)	21
Mountain lion	62	1.48	4.36	(1.46, 7.26)	18
Horse	380-1000	1.68	3.73	(0.44, 7.02)	16
Cat	3-5	2.65	7.25	(2.06, 12.41)	16
Sheep	45-160	1.73	5.63	(2.24, 9.02)	12
Black footed ferret	0.6-2	1.32	3.64	(1.05, 6.23)	11

Discussion

► Trend

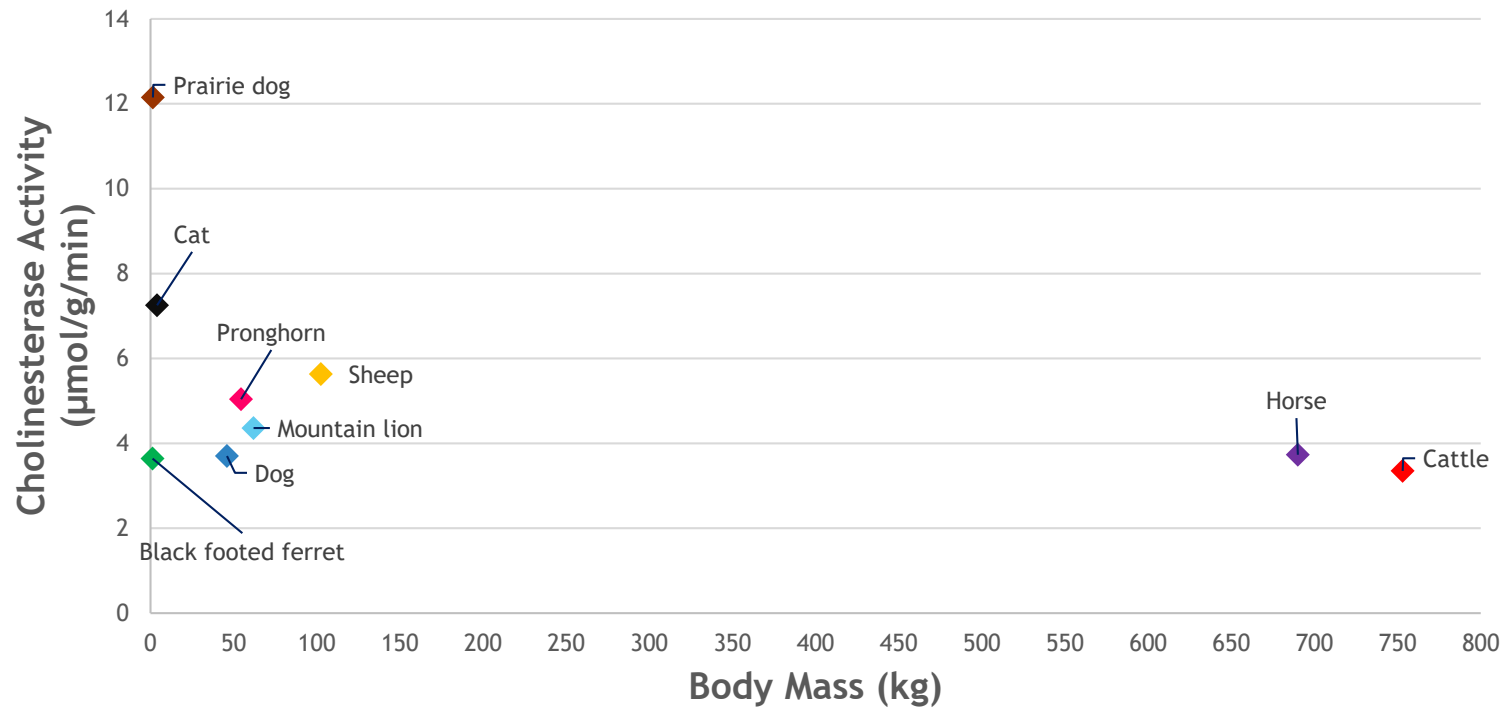
► Body mass

Effects of Body Mass on Median Cholinesterase Activity in Birds



Discussion

Effect of Body Mass on Median Cholinesterase Activity in Mammals



Discussion

Pros

- ▶ World wide use of OPs and CAs
- ▶ Determine poisoning
- ▶ Prosecute Cases



Cons

- ▶ Post mortem, field samples
- ▶ Did not have individual body weight