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Combine Influence of zinc and selenium on sub-lethal lead induced phosphofructokinase variations in different brain regions in fresh water teleosts

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Abstract
In the present investigation on long term and combined impact of selenium and zinc on sub lethal concentration of lead toxicity on different distribution of enzyme phosphofructokinase in various brain regions like (cerebrum, diencephalon, cerebellum and medulla oblongata) in *L.rohita, C.batrachus* and *C.punctatus*. fresh water teleosts.

Keywords: lead, selenium, zinc, phosphofructokinase and brain region

Introduction
Heavy metals show a wide range of affect on fishes out of which arsenic and lead are among the leading heavy metal toxicants. These heavy metals are known to alter different biochemical parameters, including glycogen level in different tissues of fishes.(Kermin-u tariang at al. 2019) [20]
Freshwater Gates contaminated with different pollutants and is a matter of concern (vinodhini and Narayan 2009)
Among the various water pollutants. Heavy metals pose a great treat to fishes. The natural aquatic system are contaminated with heavy metals released from domestic and other man made activities (Velez and Montoro 1998.)
Chelating agent are used to detoxify metals in animals, aquatic environments. In this paper the toxic effect of a complex mixture containing micronutrients iron zinc Selenium copper on Daiol radio rerio was investigated. Chilated compounds are used to detoxify elements in the aquatic environment as well as field additives for various types of farms animals (Dmitry, N. N. *et al*. 2021)

Material and Methods
Determination of Safety and Sub Lethal Concentration
Safety and Sub lethal concentrations of lead were determined on *Labeo rohita, Clarias batrachus* and *Channa punctatus* by the *Probit Analysis Method (Finney, 1971).* Higher concentration of lead were used and slowly reduced the amount of concentration to know the Lc 50/100 value for 96 hour exposure.

Enzyme Assay
The phosphofructokinase were assayed by the technique of Methods in Enzymology *Kaplan & Colowick (1970), Crane & Sole (1953), Weiser & Quill (1972), Tsai & Kemp (1974), Racker (1946). Elliott (1955) Gracy & Tilley (1973), Plummer (1988) and Shaffi and Habibullah (1977).*

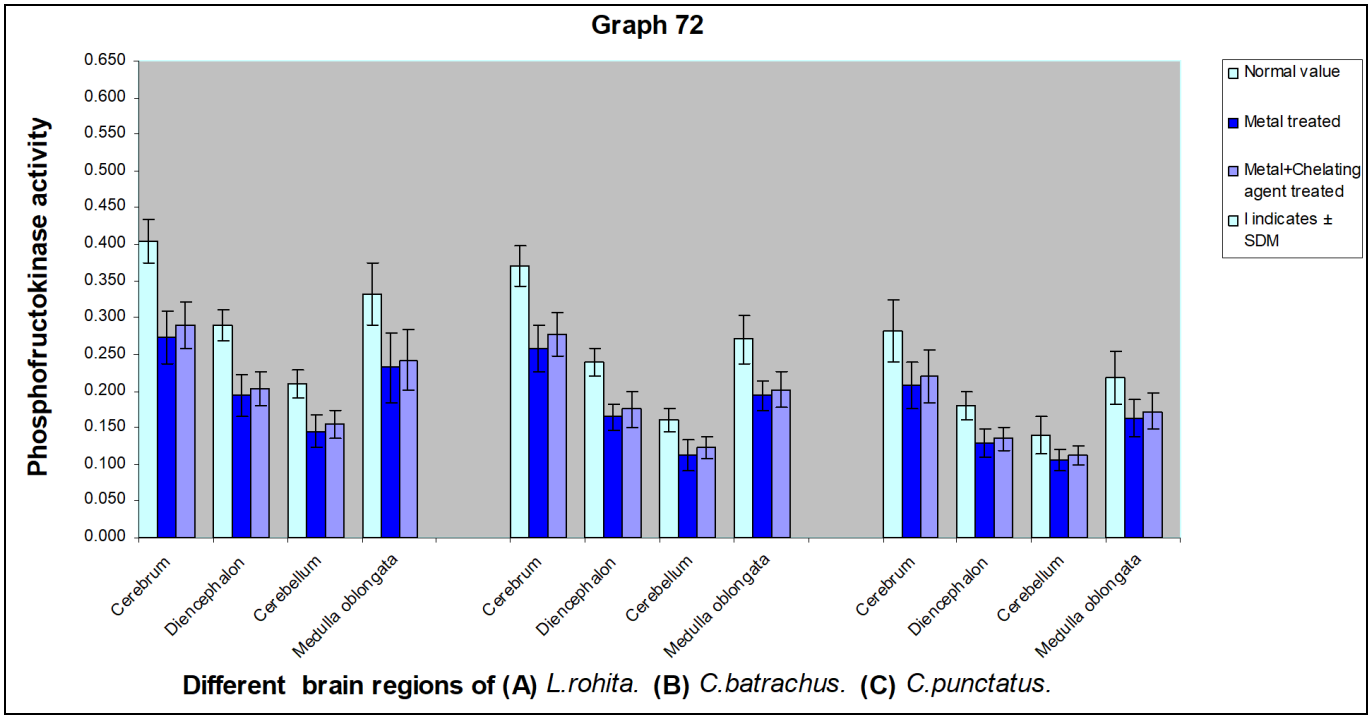
Result and Discussion
In the present investigation the author made an attempt to investigate the sub-lethal effect of lead in presence of selenium and zinc as chelating agents on differential distribution of phosphofructokinase in various brain regions (cerebrum, diencephalon, cerebellum and medulla oblongata) in *L.rohita, C.batrachus* and *C.punctatus*.
The phosphofructokinase was compartmentalised and subjected the effect of sub lethal lead and also subjected the sub lethal effect of lead in presence of selenium and zinc on long term basis. The sub lethal exposure of lead led to optimum fall in phosphofructokinase in diencephalon at 15 days followed by cerebrum at 30 days, medulla oblongata at 45 days and cerebellum at 45 days in *L.rohita,* than in *C.batrachus* (diencephalon at 15 days, cerebrum at 30 days, medulla oblongata at 30 days and cerebellum at 45 days) and in *C.punctatus* (diencephalon at 15 days, cerebrum at 45 days, medulla oblongata at 15 days and cerebellum at 15 days).
The sub-lethal impact of lead in presence of selenium and zinc led to maximum fall in phosphofructokinase in diencephalon at 30 days, followed by cerebrum at 15 days, medulla oblongata at 45 days and cerebellum at 45 days in *L.rohita,* in comparison to *C.batrachus* (diencephalon at 30 days, cerebrum at 15 days, medulla oblongata at 45 days and cerebellum at 30 days) and in *C.punctatus* (diencephalon at 30 days, cerebrum at 15 days, medulla oblongata at 45 days and cerebellum at 45 days) Among the fish species maximum enzyme fall during direct exposure and with chelating agents exposure was recorded in *L.rohita* than *C.batrachus* and *C.punctatus*. Among the regions of the brain it is diencephalon registered highest enzymes variations than the remaining brain regions (cerebrum, medulla oblongata and cerebellum).

Table 1: Influence of selenium and zinc on sub-lethal lead induced Phosphofructokinase variations in various brain regions in three freshwater teleosts-chronic studies

Name of Species	Regions of the brain	Sub-lethal (Lead) exposure					Sub-lethal (Lead) exposure with selenium and zinc				
		Control	15 days	30 days	45 days	% of F/R	Control	15 days	30 days	45 days	% of F/R
Labeo rohita (Ham.)	Cerebrum	0.404 ±0.029	0.376 ±0.032	$0.282^{e,d}$ ±0.022	$0.274^{e,d}$ ±0.036	32	0.404 ±0.029	0.346 ±0.038	0.302^{e} ±0.018	0.290^{e} ±0.032	28

	Diencephalon	0.290 ±0.022	0.231 ±0.024	0.212^{e} ±0.018	0.194^{e} ±0.028	33	0.290 ±0.022	0.276 ±0.029	0.228^{e} ±0.022	0.203^{e} ±0.024	30
	Cerebellum	0.210 ±0.019	0.192 ±0.024	0.178 ±0.019	0.145^{e} ±0.023	31	0.210 ±0.019	0.196 ±0.018	0.182 ±0.016	0.155 ±0.019	26
	Medulla oblongata	0.332 ±0.042	0.302 ±0.028	0.284 ±0.034	0.232^{e} ±0.047	30	0.332 ±0.042	0.302 ±0.026	0.286 ±0.036	0.242^{e} ±0.041	27
Clarias batrachus (Linn.)	Cerebrum	0.370 ±0.028	0.356 ±0.022	0.288^{e,d} ±0.012	0.259^{e,d} ±0.032	30	0.370 ±0.028	0.308 ±0.014	0.292^{e} ±0.022	0.277^{e} ±0.029	25
	Diencephalon	0.240 ±0.019	0.194 ±0.024	0.188 ±0.021	0.165^{e} ±0.018	31	0.240 ±0.019	0.224 ±0.029	0.192 ±0.019	0.175 ±0.024	27
	Cerebellum	0.160 ±0.016	0.149 ±0.014	0.138 ±0.018	0.113 ±0.021	29	0.160 ±0.016	0.150 ±0.019	0.135 ±0.016	0.123 ±0.014	23
	Medulla oblongata	0.270 ±0.032	0.246 ±0.030	0.214 ±0.034	0.194^{e} ±0.020	28	0.270 ±0.032	0.256 ±0.028	0.242 ±0.038	0.202^{e} ±0.024	25
Channa punctatus (Bloch)	Cerebrum	0.282 ±0.042	0.256 ±0.032	0.232 ±0.022	0.208^{e} ±0.032	26	0.282 ±0.042	0.240 ±0.038	0.232 ±0.024	0.220^{e} ±0.036	22
	Diencephalon	0.180 ±0.019	0.159 ±0.022	0.145 ±0.016	0.129 ±0.019	28	0.180 ±0.019	0.164 ±0.016	0.142 ±0.012	0.135 ±0.016	25
	Cerebellum	0.140 ±0.026	0.124 ±0.010	0.116 ±0.012	0.106 ±0.014	24	0.140 ±0.026	0.132 ±0.012	0.126 ±0.010	0.112 ±0.012	20
	Medulla oblongata	0.218 ±0.036	0.198 ±0.032	0.182 ±0.021	0.163^{e} ±0.026	25	0.218 ±0.036	0.202 ±0.024	0.190 ±0.018	0.172 ±0.024	21

Values are mean ± SDM of 7 Replicates. The data was subjected to test of ANOVA and Superscripts a-e indicates that p> 0.01, 0.02, 0.03, 0.04 & 0.05.



*F-Fall /R-Rise

Fig 1

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