



# Histopathological Effects of Some Heavy Metals and Environmental Factors on Brain of Common Carp *Cyprinus carpio*, Reared in cages and Wild Fish in Euphrates River, Babil, Iraq

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**Abstract:** The current study was conducted to study the concentrations of some heavy metals (iron, zinc, and copper) in sediment, water temperature, pH, salinity, T.D.S, O<sub>2</sub>, bod<sub>5</sub>, and histological effects on the brain of cage fish and wild fish *Cyprinus carpio* in the Euphrates River from October of 2018 until November of 2019. Three sites were selected on the Euphrates River in the middle of Iraq first site was Abu Luka in Musayyib near the thermal power station second site was Al Saddah near the cement factory third site was in the village of Al-Husayn. Results showed that in the first and second sites the concentration of heavy metal in sediments and fish brains was greater than in the third site, In general, cage fish at the first and second sites were higher than wild fish with their contents with heavy metal because they were held close to the sources of pollution. It was also noticed that the heavy metal concentration of both fish and sediment takes the following order according to the seasons of the year (summer > spring > autumn > winter), so they have a positive correlation with both the temperature and bod<sub>5</sub> and inversely correlation with the pH, salinity and T.D.S and O<sub>2</sub>, The results of histological examination of the brain showed cellular degenerative changes in telencephalon brain and metencephalon brain tissue. The pathological damage was characterized by the presence of vacuolation between neurons in regions of the telencephalon brain and metencephalon brain near the stratum per ventricular layer with the presence of inflammatory cell infiltration and presence necrosis of neurons and glial cells in visceral tissue. The concentration of zinc was below the international determinants of World Health Organization and Canadian guidelines as well as the Environmental Protection Agency. But was higher than Food and Agriculture Organization Standards. The value of copper was higher than the World Health Organization's international specifications, the Food and Agriculture Organization, and Canadian specifications, but it is within the limits allowed by the US Protection Agency.

**Keywords:** *Cyprinus carpio*, Babil, Heavy metal ecological, Histopathology, Fish Cages, Euphrates River, Iraq

Heavy metal pollution is a source of great concern due to its harmful effects on the environment, animals, and human health (Yarur et al 2019). In the past few decades, heavy metals have been polluted in aquatic environments in abundance due to increasing urbanization (Carolin et al 2017). Heavy elements are metallic elements that have a relatively high density and are toxic even if they are in low concentrations in the bodies of living organisms. (Tiimub et al 2013). (Díaz et al 2018) mention Aquatic ecosystems are more sensitive to heavy metals than terrestrial ecosystems. Heavy metals are non-degradable and can easily accumulate in living organisms, including fish (Strungaru et al 2018) There are several ways to accumulate heavy metals in fish through direct absorption from water and food (Shesterin 2010). Each of the heavy elements has physical properties, so it accumulates in certain parts of the fish body tissues more than the rest of the other body tissues (Jon et al 2006, Uysal et al 2008)

Moreover, heavy metals entering fish through the gills

have a chance to accumulate in various body systems and excessive amounts of them can reach a level toxic to humans (Kumar et al 2007), can cause hepatotoxicity, or To the kidneys (nephrotoxicity), to the central nervous system (neurotoxicity), or to the genes (genotoxicity) (Sharma et al 2014, Gupta et al 2015).

It was mentioned by (Su et al 2013) that histological biomarkers are used consistently in most toxicological studies because they indicate the general health of fish and are important indicators of environmental pollution (Omar et al 2013). As the concentrations of heavy metals in the muscles are often used as an indicator for assessing the pollution of the aquatic environment in the long term and evidence of the health risks of fish consumption by humans (Islam et al 2015).

Babil Governorate is considered a center for fish farming in Iraq and due to the presence of many industrial facilities that dump their waste untreated into the Euphrates River, which leads to increased levels of pollution and negative