International Journal of Advanced Research in Engineering Technology & Science
ISSN: 2394-2819
Email: editor@ijarets.org Volume-4, Issue-2 February- 2017 www.ijarets.org

# ANALYSIS OF HEMATOLOGICAL STUDY OF FISH *CHANNA PUNCTATUS* TREATED WITH DETERGENT AND *ENDOSULFAN*

**Anjali Rana**
Research Scholar
Sunrise University, Alwar
Rajasthan

**Dr.Ravi Bhatnagar**
Supervisor
Sunrise University, Alwar
Rajasthan

**ABSTRACT:**
The circulating blood is intricately intertwined with many facets of normal physiology and path physiologic mechanisms. Blood is a transport medium, a defense system, and an acid/base buffer system. Circulating blood is the common denominator of health and illness and alterations in its chemical or cellular illness and alterations in its chemical or cellular composition can indicate haematologic and non-haematologic disease. The erythrocytes occupy the largest fraction of the formed elements of the blood. In normal functioning of the body, the blood counts remain stable, but environmental as well as pathologic conditions can alter the RBC count. Variations in either direction outside the designated range of normal counts usually indicate an erythropoietic dysfunction.

**Key Words:** Haematologic and non-haematologic disease

HEMATOLOGICAL STUDIES

Haemoglobin is the respiratory protein contained within the erythrocytes. It has a multitude of functions in the circulatory system i.e. transport of oxygen to body tissue; removal of $CO_2$ from body tissue; acting as the most important buffer in the blood. It is a representative of the globular proteins. Any examination of the haemoglobin molecular necessarily includes the synthesis of the materials that makes up this important molecular. The body has a great capacity for conservation; it relinquishes very little of those respurces that may be reused. The destruction and reutilization of haemoglobin is a good example of this conservation. Lysis of erythrocytes when occurs in the bloodstream, is called *intravascular hemolysis* and when occurs by phagocytosis or sequestration by the reticuloendothelial system is called *extravascular haemolysis.*

The haematocrit (packed cell volume) is the volume of red blood cells in a given unit of blood. Normally, there is a direct relationship between the red blood cell count and haematocrit value-an increase in one produces an increase in the other; the converse is also true. In certain pathologic conditions, however, this relationship does not exist.

The erythrocyte indices are the vital statistics of the erythrocytes. These measurements of the corpuscles are important in evaluating the various anemia as certain indices are found diagnostically, almost without exception, for particular anemia. The indices incorporate the red blood cell count, Haemoglobin concentration and the packed cell volume. The indices are obtained by arranging results of these tests in formulate:

$$\mathrm{MCV} = \frac{\text{Haematocrit (in \%)} \times 10}{\text{No (in millions) RBC/mm}^3}$$

$$MCH = \frac{Hemoglobin\ (g/dl) \times 10}{No\ (in\ millions)\ RBC/mm^3}$$

$$\mathrm{MCHC} = \frac{\text{Hemoglobin (in g/dl)} \times 100}{\text{Hematocrit value (in \%)}}$$

The leukocytes (white blood cells) are an important part of the body's defense system. The number of white cells in the blood, compared to the number of erythrocytes, is quite small. A temporary increase in the white blood cells in the peripheral circulation is called leukocytosis and decrease in number of white cells is leucopenia.

**REVIEW OF LITERATURE:**

Effect of cadmium, endosulfan, detergent and other toxicants on fish blood has been examined by a number of workers. Cadmium has been demonstrated to induce a broad spectrum of pathophysiological conditions that are either directly or indirectly associated with erythropoiesis (Berlin and Friberg 1960., Berlin and Piscator, 1961., Fox *et al*. 1971). Cadmium has been reported to increase ALAD activity depending upon substrate availability (Wilson *et al*. 1972) and to inhibit the level of ALAD's activity (Abdulla and Haeger-Aronsen 1971). It has been observed that cadmium can decrease the circulating time of erythrocytes (Berlin and Friberg, 1960) and can cause an anemia presumably of the microcytic type (Fox *et al*. 1971). Srivastava and Mishra (1979) reported significant decrease in thrombocyte count and coagulation time in *Colisa fasciatus* after treatment with cadmium.

Decrease in erythrocyte and nuclear detergentace area in *Anabas testudineus* on exposure to sublethal concentrations of $ZnCl_2$ (300 mg/l), $HgCl_2$ (0.2 mg/l) and $CdCl_2$ (350 mg/l) has been reported by Krishna Kumari and Banerjee (1986). Ruparelia *et al*. (1986) have reported cadmium to produce the normocytic anaemia and elevated blood glucose level in *Sarotherodon mossambica.* Haematological abnormalities in *Cyprinus carpio* exposed to sublethal concentration of cadmium nitrate and mercuric chloride (0.30 ppm) for 90 hours has been reported by Beena and Viswaranjan (1987). Significant decrease in erythrocyte count and other haematologic parameters was reported in *Anabas testudineus* by Banerjee and Kumari (1988) on exposure to $LC_{so}$ concentration of Zn, Hg and CdCh for 24 houjrs. Tort and Pascual (2010) reported that cadmium did not induce any significant change in majority of blood characteristics of dogfish *Scyliorhinus canicula.* Haematological parameters were examined in five Gangetic fishes with special reference to sex and pollution harbouring between Kalakankar and Phaphaman by Shrivastava *et al*. (2011). In their study they observed higher total erythrocyte count and packed cell volume and lower mean cell haemoglobin in males than in females. Lower total erythrocyte count, haemoglobin content and higher mean cell haemoglobin values were observed in these Gangetic species than in fishes of other freshwater bodies. Exposure of *Anabas testudineus* to a sublethal concentration of cadmium for 30, 45 and 60 days resulted in significant increase in RBC count, WBC count and haemoglobin concentration (Saravanam and Natarajan, 2011). Thallium nitrate induced anemia and decrease in RBC count, Haemoglobin and PCV and increase in the MCHC, WBC count and MCH values have been reported by Garg *et al*. (2011). Ahmad and Datta Munshi (2012) have observed that red blood cell morphology of *Catla catla* exposed to 96 hours showed shrinkage and crenation in their configuration alongwith slight erythronisocytosis and degeneration of cell membrane. Ravindra Kumar and Agarwal (2013) have reported significant decrease in RBC, Hb, ESR and MCHC and increase in WBC count after 15 and 30 days of exposure to sublethal concentration of mercuric chloride in *Clarias batrachus.*

Malathion is reported to cause erythropenia and other changes in the blood of *Clarias batrachus* (Linn.) by Mukhopadyhay and Dehadrai (1980). Goel *et al*. (1982) have reported anemia in *Heteropneustus fossilis* after malathion exposure with decreased RBC, haemoglobin and haematocrit value. Srivastava and Mishra (1983) have found thrombocytopenia in different piscine species exposed to organophosphate pesticides. Occurrence of erythrocytic necrosis resulting in hypochromic microcytic anemia has been reported in *Tilapia mossambica* exposed to thiodon by Srinivasan (1983). Lindane is reported to cause increase in TEC, Hb, PCV, TLC in *Heteropneustes fossilis* by Srivastava and Mishra (1985). Significant decrease in RBC, Haemoglobin and PCV associated with a decrease in MCHC has been observed by Goel and Maya (1986) in *Clarias batrachus* exposed to Ragor. Variations in blood parameters of the fish *Channa punctatus* exposed to organophosphorus pesticides have been studied by Chakrabarty and Banerjee (1988). The effect of exposing

*Channa punctatus* to endosulfan for 30 days caused decrease in TEC, TLC, Hb and PCV as reported by Abidi and Srivastava (1988). Munni Kumari *et al*. (1989) reported decrease in clotting time in *Clarias batrachus* after treatment with cythion, metacid, DDT and lindane.

Kumar and Banerjee (1990) noted decrease in Haemoglobin and PCV and increase in ESR in the blood of *Clarias batrachus* exposed to sevin. Exposure to sevin caused hypochromasia, crenation of erythrocyte membrane, decrease in TEC, Hb, MCH, MCHC, TLC and in small lymphocytes count in *Clarias batrachus* (Birendra and Banerjee, 2011). DDT induced polycythaemia in an Indian cat fish *Clarias batrachus* with increase in TEC, Hb and PCV has been reported by Munni Kumar and Yadav (2012). Exposure of the carp, *Cyprinus carpio* to malathion caused decrease in Hb and RBC and increase in leucocyte count (Ramesh *et al*. 2012). The effect of sublethal concentrations of Alachlor and Rogor on *Heteropneustus fossis* was studied after 5 to 30 days by Chaturvedi and Agarwal (2013). The results indicated a significant decrease in Haemoglobin, PCV, MCHC and clotting time whereas MCV and MCH were elevated.

**RESULTS:**

**TABLE – 1**

Alteration in hematological parameters in *Channa punctatus* exposed to cadmium, detergent and endosulfan after 30 days post exposure.

| **Parameters** | **Control** | **Cadmium** | **Detergent** | **Endosulfan** | **Cadmium + Detergent** | **Cadmium + Endosulfan** | **Detergent + Endosulfan** | **Cadmium + Endo. + Detergent** |
|---|---|---|---|---|---|---|---|---|
| Hb (mg/dl) | 6.02±0.05 | 4.7±0.37 | 5.40±0.37 | 7.50±0.30 | 7.80±0.43 | 8.0±0.55 | 8.10±0.47 | 6.0±0.47 |
| TEC (Million/ $mm^3$) | 3.25±0.37 | 2.30±0.16 | 2.10±0.30 | 4.0±0.19 | 1.8±0.37 | 3.70±0.13 | 3.50±0.11 | 2.86±0.17 |
| TLC ($x10^4$ $m^3$) | 6.8±0.36 | 7.5±0.73 | 4.7±0.13 | 4.25±0.22 | 4.15±0.44 | 5.10±0.25 | 6.8±0.15 | 2.8±0.22 |
| PCV (%) | 33±1.52 | 18±1.0 | 26±2.0 | 32±2.0 | 28±2.08 | 22±1.34 | 30±2.51 | 31±1.0 |
| MCV (fl) | 101.53 ±4.10 | 78.26± 6.06 | 123.80 ±6.68 | 80.00 ±10.05 | 155.55 ±5.63 | 59.45± 9.78 | 85.71± 20.50 | 108.39 ±5.90 |
| MCH (pg) | 18.53± 1.45 | 20.43± 2.26 | 25.71± 1.24 | 18.75 ±1.55 | 43.33± 1.16 | 21.62± 0.24 | 23.14± 0.25 | 20.97± 0.40 |
| MCHC (mg/dl) | 18.24± 0.39 | 26.11± 0.37 | 20.76± 0.18 | 23.43 ±0.15 | 27.85± 0.20 | 36.36± 0.41 | 27.00± 0.20 | 19.35± 0.48 |

Values are mean ± SD; n= 6

*Significant, $p<0.05$**,** $p<0.01$, $p<0.001$

**TABLE – 2**

Alteration in hematological parameters in *Channa punctatus* exposed to cadmium, detergent and endosulfan after 45 days post exposure.

| **Parameters** | **Control** | **Cadmium** | **Detergent** | **Endosulfan** | **Cadmium + Detergent** | **Cadmium + Endosulfan** | **Detergent + Endosulfan** | **Cadmium + Endo. + Detergent** |
|---|---|---|---|---|---|---|---|---|
| Hb (mg/dl) | 7.00±0.52 | 6.60±0.36 | 6.30±0.37 | 5.6±0.28 | 8.25±0.23 | 7.90±0.35 | 7.7±0.35 | 9.0±0.43 |
| TEC (Million /$mm^3$) | 3.40±0.25 | 2.90±0.11 | 2.46±0.12 | 2.9±0.08 | 1.90±0.25 | 4.0±0.16 | 3.3±0.13 | 3.90±0.10 |
| TLC ($x10^4$ $m^3$) | 7500± 0.92 | 7800± 0.78 | 7700± 0.54 | 7500±0.17 | 6200± 0.29 | 6350±0.18 | 1030± 0.18 | 5600±0.29 |
| PCV (%) | 31±1.53 | 27.5±1.52 | 22.0±1.53 | 30.0±1.0 | 24.0±1.32 | 29.0±1.0 | 29.50± 1.0 | 21.0±1.0 |
| MCV (fl) | 91.17± 5.84 | 94.82± 7.67 | 89.43± 12.7 | 103.44 ±11.70 | 82.75± 6.08 | 72.50± 12.04 | 89.39± 7.35 | 53.84±9.80 |
| MCH (pg) | 20.58± 1.96 | 22.75± 1.84 | 25.60± 0.32 | 19.31± 0.30 | 43.42± 0.92 | 19.75± 0.47 | 23.33± 0.38 | 23.07±0.23 |
| MCHC (mg/dl) | 22.58± 0.33 | 24.00± 0.24 | 28.63± 0.24 | 18.66± 0.28 | 34.37± 0.15 | 27.24± 0.17 | 26.10± 0.18 | 22.85±0.43 |

Values are mean ± SD; n= 6

*Significant, $p<0.05$**,** $p<0.01$, $p<0.001$

**TABLE – 3**

Alteration in hematological parameters in *Channa punctatus* exposed to cadmium Detergent and endosulfan after 60 days post exposure.

| Parameters | Control | Cadmium | Detergent | Endosulfan | Cadmium + Detergent | Cadmium + Endosulfan | Detergent + Endosulfan | Cadmium + Endo. + Detergent |
|---|---|---|---|---|---|---|---|---|
| Hb (mg/dl) | 6.85±0.34 | 5.95±0.29 | 5.70±0.27 | 5.20±0.51 | 8.10±0.29 | 7.20±0.43 | 7.70±0.47 | 8.50±0.46 |
| TEC (Million/$m^3$) | 3.15±0.18 | 1.95±0.05 | 1.95±0.10 | 2.80±0.17 | 1.80±0.05 | 3.60±0.01 | 4.00±0.16 | 3.95±0.12 |
| TLC ($x10^4$ $m^3$) | 7200±0.62 | 8200±0.61 | 10800±0.94 | 5900±0.18 | 9000±0.06 | 5250±0.15 | 8850±10.18 | 6500±0.18 |
| PCV (%) | 31±1.0 | 27.5±1.08 | 29.5±1.51 | 27.0±2.0 | 35.0±2.08 | 22.3±2.08 | 22.00±2.08 | 28.50±1.50 |
| MCV (fl) | 98.41±10.15 | 141.02±2.16 | 151.0±10.20 | 96.42±1.85 | 194.44±35.20 | 61.94±21.7 | 55.00±27.23 | 72.15±11.8 |
| MCH (pg) | 21.74±1.72 | 30.51±0.17 | 29.23±2.75 | 18.57±0.33 | 45.00±0.20 | 20.00±0.06 | 19.25±0.35 | 21.51±0.26 |
| MCHC (mg/dl) | 22.09±0.17 | 21.75±0.27 | 19.32±0.18 | 19.25±0.25 | 23.14±0.14 | 32.28±0.28 | 35.00±0.22 | 29.82±0.30 |

Values are mean ± SD; n= 6

*Significant, $p<0.05$**,** $p<0.01$, $p<0.001$

**CONCLUSIONS:**

Hematological studies showed that exposure of *Channa punctatus* to cadmium, detergent, endosulfan and their combinations caused marked alteration in hematological parameters, emphasizing anemic and leucotoxic effect of heavy metals, pesticide and detergent on blood.

**REFERENCES**

1. Dange, A.D. (1986a): Changes in carbohydrate rnetabolisn1 in Tilapia, *Oreochromis (Sarotherodon) mossambicus,* during short tern1 exposure to different types of pollutants. Environ. Pollut. 41, 165-177.
2. Das, S.K. and A. Kamraj (1990): Accumulation of cadmium in *Heteropneustes jossilis* and change:- in haelnatological parameters J. NATCON. 2, 25-30.
3. Denton, G.R.W. and C. Burdon-Jones (1981): Influence of ternperature and salinity on the uptake, distribution and depuration of Illereury, cadluiulll and lead by the black-lip oyster *.S(1ccoslrea echinata*. Mar. BioI., 64, 317-326.
4. Eller, L.L. (1971): Histological lesions in cut throat trout (Salrno clarki) exposed chronically to the insecticide endrin. Am. J. Patho!. 64, 321-336.
5. Garg. V.K.. Singh, D.V.. Garg.. S.R.. and S.K. Tyagi (2003): Haematological alteralin in lead exposed fish *Clarias hatrachus.* Ad. Bios. 9(1). 79-84.
6. Gill, T.S., Tewari, M. and J. Pande (200l): *In vivo* and *in vitro* efTecls of cadmium on selected enzymes

in diffennt organs of the fish *Barbus conchonius.* Ham (Rosy barb). COlnp. Biochenl. Physiol. 100C, 501-505.

7. Godin, P. (1983): Les sources de pollution des sols: Essai de quantification des risques dus aux elements traces. Sci. duo Sol. 5,73-87.
8. Goel, K.A and Maya (1986): Haematological anamolies in *Clarias batrachus* under the stress ofrogor. Ad. Bios. 5(11), 187-192.
9. Khan. N.A .. Alullcd. 1\ .. NomClni. 1\.1\. and M. 1\J lila I (1981): Atomic absorption spectrophotornetric studies or cadnliurn and zinc in commercial fertilizers, soils, and river W;"1ters. Environ. Pollut. 2, 259-264.
10. Roy, D. (1989):, Detergent-induced changes in the mapping of certain enzymes in various cell types of *Rita rita*. Ecotoxicology and Environmental safety 17, 59-66.
11. Sadhu, A.K., Chowdhary, D.K. and P.K. Mukhopadhyaya (l985): Relationship between serum enzymes histological features and enzymes in the hepatopancreas after sublethal exposure to malathion and phosphamidon in the murrel Channa *striatus.* Bl. Intern. J Environ. Studies, 24, 35.