

The Profile of Blood Transaminase Enzyme on Duck (*Anas sp.*) Polluted by Lead (Pb) Textile Waste

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ABSTRACT

Duck which is raised traditionally in around of textile industry have a risk by lead (Pb) pollution from textile industry liquid waste, will caused hepatocyte liver. Decrease liver function, has the impact to vitellogenesis that is synthesis of vitellogenin and β -lipoprotein as yolk precursor. Transaminase is enzyme which is indicated decrease in liver function. Objectives of this research was to know the profile of blood transaminase enzyme (SGPT= serum glutamate pyruvate transaminase, SGOT = serum glutamate oxaloacetate transaminase) on duck that polluted by lead (Pb) from textile waste. This experiment has been used survey method with purposive sampling, amount of sample used was 60 Tegal duck, consisted of 30 duck which was not polluted by Pb and 30 duck which was polluted by Pb. The data was analys by statistical analysis of T-students. Based on research showed that blood SGPT level which was polluted Pb higher significant different $76,74 \pm 1,89 \mu\text{mol/L}$ against which was not polluted $47,93 \pm 1,59 \mu\text{mol/L}$, and so it is with SGOT level was higher significant different $78,73 \pm 2,73 \mu\text{mol/L}$ polluted by Pb, against which was not polluted was $46,52 \pm 1,53 \mu\text{mol/L}$.

Key words: transaminase, lead (Pb), duck

INTRODUCTION

Duck which is raised traditionally in around of textile industry have a risk by lead (Pb) pollution from textile industry liquid waste, that cause hepatocyte to liver. Decrease in liver function, has the impact to vitellogenesis that is synthesis of vitellogenin and β -lipoprotein as yolk precursor. Transaminase is enzyme which is indicated decrease in liver function.

Accumulation of excess Pb can potentially cause liver damage that is clinically characterized by increased SGPT (serum glutamic-pyruvic transaminase) and AST (serum glutamic-oxaloacetic transaminase). Degree increase in these enzymes correlated positively with the level of liver damage. Biochemical changes due to liver damage, manifested by the increase of ALT levels from 20-200 times the normal levels ($1-36 \mu\text{M} / \text{L}$) and AST levels by 10-150 times the normal values ($8-40 \mu\text{M} / \text{L}$) (Bergmeyer and Bernt, 1971).

Pb concentrations in water, soil and air around industrial areas may reach 0.2 ppm and wastewater regulations limit the conditions 0.05 ppm (Amina, 2006), whereas Pb concentrations of wastewater based on preliminary research results is 0.207 ppm,

Pb content of blood contaminated duck waste textiles based on preliminary research results by using Atomic Absorption Spectrophotometer (AAS type) reached 0.07 ppm, whereas the Pb content of blood is not contaminated duck waste textiles reach 0.0005 ppm. Based on preliminary research results, there is a heavy metal content of Pb in waste water higher than the content of heavy metals other than Pb content of blood was contaminated ducks to reach 0.07 ppm indicate the occurrence of heavy metal pollution Pb in ducks raised in the neighborhood textile industry.

MATERIALS AND METHODS

Animals and Survey

Animals used in this research were 60 Tegal Ducks, 10-12 months age, average body weight 1.6 kg. Sampling method used was sampling purposif sampling, consist of 30 ducks polluted by lead and 30 ducks not polluted by lead.

Survey have been made during 30 days and blood sample collected every week (forth time/ 4 weeks).

Parameters

1. Glutamate Pyruvat serum transaminase (SGPT/ALT).

This enzyme produced by liver cells and functions to catalyzed alpha-amino group of alanine to alpha-ketoglutaric acid.

2. Oxaloacetat Glutamate 2 Serum transaminase (SGOT/AST)

This enzyme catalysis the transfer functions for alpha-amino group of aspartic acid to alpha-ketoglutaric acid.

ALT and AST levels are determined by using Clinical Auto Analyzer Cobas Type C-111. The sample was measured using a photometric system with wavelength 340-659 nm.

Data Analysis

This study used analysis of T-student population:

- Population 1 = duck contaminated textile
- Population 2 = duck population is not contaminated textile pollution.

RESULTS AND DISCUSSION

Averages Level of SGPT and SGOT of duck blood polluted and not polluted of Pb

Serum OF Glutamate Pyruvat Transamnase (SGPT) and Serum Glutamate Oxaloasetat Transaminase (SGOT) were transaminase enzym that referable to evaluation of liver function. Average level of SGPT and SGOT of duckblood polluted and not pulled of Pb showed in Table 1.

Table 1. Averages Level and Analysis Results of SGPT and SGOT of duck blood polluted and not polluted of Pb

Level	Environmental condition		Results of Analysis
	Polluted	Not polluted	
µM/L.....		
SGPT	76.74 ± 1.89	47.93 ± 1.59	P < 0,01
SGOT	78.73 ± 2.73	46.52 ± 1.53	P < 0,01

Table 1 showed of SGPT level average of duck blood polluted Pb were 76.74 ± 1.89 µM/L and not polluted by Pb were 47.93 ± 1.59 µM/L.

Analysis result showed that average of transaminase enzym (SGPT and SGOT) level was difference significant (P<0.01), between duck polluted and not polluted by Pb. It was showed that take effect higher Pb accumulation,

so much so that caused reduced of liver function. Increasing SGPT and SGOT level would happened if there were releasing enzym in accordance with intracellular to into blood that caused hepatocyte, eg nekrosys hepatoseluler or infark miokardial (Bijanti, 2006).

Serum glutamic-pyruvic transaminase (SGPT/ALT) is an enzyme sitosolik contained in these organs function as catalyst of removal of the alpha amino acid alanine to alpha ketoglutarat. ALT is most abundant in the liver. ALT values are considered normal is 1 to 36 µM / L. These levels will rise rapidly and exceed the normal case of liver cell necrosis, or do not have this enzyme eliminated out (Darmono, 2001). Based on our research ALT levels average for ducks contaminated with Pb metal reached 76.74 ± 1.89 µM / L, this shows an increase of ALT levels reached three times the normal levels (1-36 µM / L), ALT levels whereas the average for the ducks that are not polluted by Pb metal was 47.93 ± 1.59 µM / L.

Serum glutamic-oxaloacetic transaminase (SGOT/AST) many founded in the heart, liver, muscle, panckreas, lung, eritrocite, brain cells. Although this enzyme used for lever testing, its high level founded in the muscle. Contain of SGOT in the blood are 8-40 µM/L. Function of SGPT was transfer catalys of alfa-amino group from aspartate acid to be alfa ketoglutarat acid (Darmono, 2001).

Based on our research AST levels average for ducks contaminated with Pb metal reached 76.3 µM / L, this shows an increase of AST levels reached twice normal levels (8-40 µM / L), while the average levels of AST average for the ducks that are not polluted by Pb metal was 46.52 ± 1.53 µM / L.

Increased levels of transaminase enzymes infected duck blood Pb can be explained due to liver tissue damage occurs through a reduction in its function as a result of ion exchange of important minerals such as K, Na, P and others into Pb ions and the formation of the complex formation as Suhendrayatna (2008) suggests that the network bodies, contamination of Pb²⁺ ions bind to the cell membranes of two different ways, the first exchange of monovalent ions and divalent ions such as Na, Mg, and Ca on the cell membrane is replaced by ions of heavy metals (Pb), and second is the complex formation between Pb ions with functional groups like carbonyl, amino, thiol, hydroxyl, phosphate, and hydroxyl-carboxyl is located on the cell

membrane, this phenomenon has led to decreased cell function until the death of cells (hepatosis).

Toxicity of lead (Pb) in various organs is mediated through several mechanisms including inactivation of enzymes and other macromolecules through bonds with sulfhydryl, phosphate, and carboxyl and interaction with cations, especially calcium, zinc and iron. Pathological processes can occur in the cell membrane and mitochondria, function and neurotransmitter synthesis, heme synthesis, cellular redox status and nucleotide metabolism. Adverse effects can occur in nerve, kidney, gastrointestinal tract, hematopoiesis, reproductive and cardiovascular system. Pb metal including metal-metal bond is more reactive with the ligand in the cell, if the metal binding cells of (non-essential), it will cause damage to the catalyst capability (detoksikasi) of the cell itself (Darmono, 1995).

Related to this, Alifia and Djawad (2003) and Vodela, et al., (2007) suggests that the degeneration of parenchymal damage characterized by changes hepatosis or liver cell death that causes the specific enzymes involved in metabolism of protein migration into blood vessels. Associated with specific enzyme migration into blood vessels, Kimball (1983) and Linder (2006) suggested that the transaminase enzymes can be indicators of liver damage.

CONCLUSION

Based on research inferential that duck polluted by lead significantly undergo increased level of SGPT and SGOT

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