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# ANALYSIS OF HEAVY METAL LEAD (PB) AND MERCURY (HG) IN COASTAL CITY OF PREPARE, INDONESIA

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## Abstract

This study aims to analyze the content of Lead (Pb) and Mercury (Hg) heavy metals in the coastal City of Parepare. The research sample using seawater taken at three different coastal locations, the first coastal Lakessi Market, both in coastal embankments Soreang, third on the coast of Fish Distribution Base. The research sample was tested using the Atomic Absorption Spectrophotometer (AAS). The results showed that the heavy metal content of Lead (Pb) and Mercury (Hg) varied in each location. At the first location Pb as much as 0.008 ppm, Hg as much as 0.006 ppm, the second location Pb as much as 0.06 ppm, Hg as much as 0.007 ppm, and the third location Pb as much as 0.03 ppm, Hg as much as 0.003 ppm. Our results confirm that the heavy metal content of Pb and Hg in seawater on the coast has exceeded the threshold determined by the government.

***Keywords*** **:** Lead (Pb), Mercury (Hg), Seawater, Coastal.

## Introduction

Heavy metals that are sources of pollutants that have the potential to reduce and damage the quality of the environment (Sholehhudin *et al*. 2018; Sari *et al*. 2019; Yulianto *et al*., 2019) are Lead (Pb) and Mercury (Hg). The nature of heavy metals that are difficult to decompose can easily accumulate in aquatic environments, sediments, as well as in marine biota (Carolin *et al*., 2017; Azizah *et al*., 2018)

Pb heavy metal is not expected to be present in the body of living creatures, although in very small amounts, this is because it is very toxic or toxic (Taguge, Olii & Panigoro 2014). Toxic effects of Pb in children are a very heavy impact, which can affect the development of the brain and nervous system. In adults, it will cause long-term damage, including an increased risk of high blood pressure and kidney damage., for pregnant women at risk of miscarriage, stillbirth, premature birth, and low birth weight (WHO, 2019).

One of the superior areas on the coast of South Sulawesi is the waters of the City of Parepare. These waters play a role and function as a port service center, loading, and unloading of goods, distribution of oil, industrial development zones, cultivation of settlement systems and development of the food sector so that it has prospects to be developed and has the potential to trigger pollution (Hadi, 2013). In addition to the high human activity in the waters, the City of Parepare, such as fishing and swimming, can have a direct impact on them.

## Materials and Methods

### Sea Water

The research sample used was seawater originating from the coast of the City of Parepare. Seawater that allows containing heavy metals pollutes in the sea because there are many fishing boats and port activities. But it also often utilized by people to take marine life such as fish and shellfish in the sample.

### Subjects

There are three sampling points carried out in the waters of the City of Parepare namely: at the first point behind Lakessi Market, at the second point is the estuary of the sewage disposal channel of the community around the waters of the Soreang Embankment, at the third point which is near the Fish Distribution Base. At that point, it is a place that has a dense marine activity, and the place is commonly used by the community to take marine biota such as fish and shellfish in the waters of the Soreang Embankment.

### Descriptive Design

This research uses descriptive research method. The research sample was taken at three different locations. Water sampling using the composite method is the method of merging samples taken from three different depths (0.2d; 0.5d; 0.8d where d = depth of the sampling location measured from the surface) at relatively the same time and with the same volume then put into a bucket and then homogenized and ex-situ inspection. Then put into a 600 ml bottle of polyethylene that has been labeled and then put in a coolbox to be preserved, which is then taken to the Laboratory for analysis.

### Sea Water Analysis

Before being analyzed, seawater is first destructed. Destruction method used is wet destruction, where refurbishment samples with strong acids, either single or mixed (Kristianingrum, 2012). The results of the analysis of heavy metal content in seawater for Pb were tested using an Atomic Absorption Spectrophotometer (AAS), while the Hg testing was carried out ex-situ.

## Results

Data shows that all three sampling points contain heavy metals Pb and Hg. Testing of heavy metal content (Pb and Hg) in seawater was conducted at the Makassar Health Laboratory Center (BBLK), it was found that the first point contained Pb of 0.08 ppm, the second point contained Pb of 0.06 ppm, and at the third point containing Pb of 0.03 ppm.

The highest Hg concentration results were found in the second point of seawater, which was 0.007 ppm. Then followed by Hg concentration in seawater at the second point of 0.006 ppm. While the lowest concentration is in seawater at the third point that is equal to 0.003 ppm, in this study, it was seen that the concentration of heavy metals (Pb and Hg) contained in seawater esxceeded the threshold of the Decree of the Minister of Environment (KEPMEN LH) No. 51 of 2004 concerning seawater quality standards (MENLH, 2004) (Table 1).

**Table 1 :** Results of Analysis of Heavy Metal Content (Pb and Hg) in Seawater in the Coastal City of Parepare

| Sample Point | Heavy Metal Parameters | |
|---|---|---|
| | Pb (mg/L) | Hg (mg/L) |
| Point I | 0.08 | 0.006 |
| Point II | 0.06 | 0.007 |
| Point III | 0.03 | 0.003 |
| Threshold* | 0.008 | 0.001 |

*According to KEPMEN LH No. 51 of 2004

## Discussion

The results of the research that have been carried out indicate that all three sampling locations, all containing Pb and Hg, which exceed the threshold in seawater. The presence of PB in seawater is caused by the large number of activities that occur around the sampling location. Sampling locations around the market have triggered an increase in domestic waste disposal leading to waters and locations near the port, as well as where fuel is distributed. Port activities can be a source of heavy metal pollution in the surrounding waters. The results of this study are reinforced by several other studies that show that the source of heavy metal pollution is industrial wastewater and port activities (Sany *et al*. 2013; Ismarti *et al*. 2017; Rizkiana & Karina 2017; Azizah *et al*. 2018). Pb can pollute water through ballast water discharge and emissions from oil-fueled engines. Apart from having adverse effects, Pb is also used as an ingredient in the paint, which is useful for accelerating the drying of the process layer through oxidation and polymerization in the ship repair business (Ismarti *et al*., 2017).

Another thing that greatly affects the heavy metal pollution of Mercury (Hg) is due to the presence of gold waste (Tomiyasu *et al*., 2017). At the first point, there is a gold shop with a distance of about 200 meters from the sea. This is likely to be the main cause of the increase in the concentration of heavy metals Mercury (Hg) compared to the second point area. But it is unfortunate because, in the second location, many people use it for swimming and fishing, so mercury-contaminated with seawater will stick to human skin causing skin problems (Budnik & Casteleyn, 2019). Exposure to mercury is a serious health threat to various human organs, namely histopathological changes in the brain, liver, kidneys, and testicles (Zhou *et al*., 2019).

Heavy metals enter the human body through the water directly or through the food chain, then accumulate in the human body, especially the liver and kidneys. At high levels in the human body, it will cause serious negative effects, including inhibiting the activity of enzymes, so that the metabolic process is disrupted, causing chromosomal abnormalities (genes), inhibits fetal development, decreases female fertility, inhibits sperm formation in men (spermatogenesis), reduce peripheral nerve conduction, inhibit the formation of hemoglobin, cause kidney damage, cause blood deficiency (anemia), cause emotional and behavioral disorders, and within a certain period can poison the body of living things (Tutic *et al*., 2015). In addition, other studies report that mercury in the environment can also cause autoimmunity. A number of studies have reported that people with autoimmune diseases have higher blood Hg concentrations compared with healthy people (Crowe *et al*., 2017).

Besides, the parameters that affect the concentration of heavy metals in the waters are temperature, salinity, current, pH, and total suspended solids or seston. The interaction of these factors will affect fluctuations in heavy metal concentrations in wáter (Driscoll *et al*., 2013). The waters of the City of Parepare are very susceptible to heavy metal pollution (Pb and Hg) originating from human activities found around these waters. This is a problem for the environment and human health.

The high utilization of waters, both directly and indirectly, makes it easier for humans to be exposed to heavy metals. Increased human exposure to methylmercury is mainly due to the consumption of estuarine and marine fish. The developing fetus is most at risk from this neurotoxin, but the health effects of a highly exposed population (Driscoll *et al*., 2013).

## Conclusion

The results of this study indicate that the concentration of heavy metals (Pb and Hg) contained in water exceeds the threshold set by the government.

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