A STUDY OF THE HEAVY METAL IN TAP WATER QUALITY IN GAMBANG AREA, PAHANG

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Report submitted in fulfillment of the requirements for the award of the degree of Bachelor of Occupational Safety and Health with Honours

Faculty of Engineering Technology
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DECEMBER 2017
SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor of Occupational Safety and Health.

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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at University Malaysia Pahang or any other institutions.

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ABSTRACT

Drinking water should be free from harmful levels of impurities such as heavy metals and inorganic element. Contamination of heavy metal in drinking water can poses adverse health effects to human body. Cross sectional comparative study was conducted in University Malaysia Pahang campus Gambang at residential college 1, 3 and 4 for measure the heavy metal concentration, physical and chemical properties. Through this research, the perception of water quality at the college was measured by distributed the questionnaires to the resident. The instrument used in data collection was Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) to measure the concentration of heavy metal which is lead (Pb), copper (Cu), nickel (Ni), cadmium (Cd), zinc (Zn), chromium (Cr) and aluminium (Al) in tap water. Most of heavy metal concentration were below than 0.100 ppb. Aluminium concentration was 120.0 ppb at residential college 4 but it still in safe level as drinking water.
MINUM AIR HARUS BEBAS DARIPADA PARAS KEKOTORAN YANG BERBAHAYA SEPERTI LOGAM BERAT DAN UNSUR TAK ORGANIK. PENCEMARAN LOGAM BERAT DALAM AIR MINUMAN BOLEH MENIMBULKAN KESAN BURUK KEPADA TUBUH KITA. KAJIAN PERBANDINGAN KERATAN RENTAS DIJALANKAN DI KAMPUS UNIVERSITI MALAYSIA PAHANG GAMBANG DI KOLEJ KEDIAMAN 1, 3 DAN 4 UNTUK MENGUKUR KEPEKATAN LOGAM BERAT, SIFAT FIZIKAL DAN KIMIA. MELALUI PENYELIDIKAN INI, PERSEPSI KUALITI AIR DI KOLEJ DIUKUR DENGAN MENGAGIHKAN PERTANYAAN KEPADA PENDUDUK. INSTRUMEN YANG DIGUNAKAN DALAM PENGUMPULAN DATA ADALAH SPEKTROMETRI PELEPASAN OPTIK PLASMA DIGUNAKAN SECARA INDUCTIVELY (ICP-OES) UNTUK MENGUKUR KEPEKATAN LOGAM BERAT YANG MEMIMPIN (Pb), TEMBAGA (Cu), NIKEL (Ni), KADMIUM (Cd), ZINK (Zn), KROMIUM (Cr) DAN ALUMINIUM (Al) DALAM AIR PAIP. KEBANYAKAN KEPEKATAN LOGAM BERAT ADALAH KURANG DARIPADA 0.100 ppb. KEPEKATAN ALUMINIUM ADALAH 120.0 ppb DI KOLEJ KEDIAMAN 4 TETAPI IA MASIH DALAM PARAS SELAMAT SEBAGAI AIR MINUMAN.
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<tbody>
<tr>
<td>%</td>
<td>Percentage</td>
</tr>
<tr>
<td>°C</td>
<td>Degree Celsius</td>
</tr>
<tr>
<td>µg/l</td>
<td>Microgram per litre</td>
</tr>
<tr>
<td>ppb</td>
<td>Part per billion</td>
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<tr>
<td>mg/l</td>
<td>Milligram per litre</td>
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# LIST OF ABBREVIATIONS

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<tr>
<td>DOE</td>
<td>Department of Environment</td>
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<tr>
<td>UMP</td>
<td>University Malaysia Pahang</td>
</tr>
<tr>
<td>NDWQSP</td>
<td>National Drinking Water Quality Surveillance Programme</td>
</tr>
<tr>
<td>ICP-OES</td>
<td>Inductively Coupled Plasma Optical Emission Spectrometry</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WQI</td>
<td>Water Quality Index</td>
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<tr>
<td>INWQS</td>
<td>Interim National Water Quality Standard</td>
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<td>BOD</td>
<td>Biochemical Oxygen Demand</td>
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<tr>
<td>MSDWQ</td>
<td>Malaysian Standard of Drinking Water Quality</td>
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<tr>
<td>DWDS</td>
<td>Drinking Water Distribution Systems</td>
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<tr>
<td>SDWA</td>
<td>Safe Drinking Water Act</td>
</tr>
<tr>
<td>USEPA</td>
<td>United States Environment Protection Agency</td>
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<td>EU</td>
<td>European Union</td>
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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Nowadays water pollution cases were increased suddenly in statistic because of many factors that disturbing the sources of water. Furthermore, the increase number of factory that produce chemical give rises to wastewater product thus it can give direct impact to the river that near the factory due to illegal disposal the waste into river. Recently, uses of water are much needed and the clean water are really required especially as drinking water because good health started with good food and drink that enter the body. So people must get enough clean water to increase their work performance. This study is to evaluate the heavy metal in water and to determine the parameter in tap water quality. Heavy metals in our distribution system cannot be detected by sight, smell and taste. This section is briefly explained about the background study, problem statement, research objectives, research questions, research hypothesis, scope of study, significance of study, conceptual framework and operational definition of the study.

1.2 BACKGROUND STUDY

During few decades ago, natural resources are very useful to all people for daily activities especially as water resources. Water resources are present in three (3) forms in Earth which is solid during freezes, liquid, and gases when vapour in the air. According to Julie Kerr Casper (2007) in her book, from all water in the Earth only 3% is freshwater and 70% almost frozen in glazier and the polar ice caps. Recently, water supply in many parts of the world are less than water demand. Water supply is an important issue that
need to be concerned about its safety and quality. In addition, our body consist about 70% of water. Few years ago, public awareness about the quality of water for drinking water has been increased. A number of alternatives used by residents to rise the quality of drinking water including water filter and neutralization filter. In 1983, the Department of Environment (DOE) launched a National Drinking Water Quality Surveillance Programme (NDWQSP) in response to the increasing pollution of surface waters which had resulted in high occurrence of waterborne diseases (Aini et al., 2007). Nowadays, the most important issue is drinking water quality and some researcher shows that presently more than 1.2 billion people around the world do not received good water quality and the water are not safe for drink (Rashid, Praveena, & Aris, 2015).

1.3 PROBLEM STATEMENT

Water usage are very useful for daily activities such as washing, bathing, drinking, cooking and sanitation for us. Water are treated before supplied to the resident, however there is possibility the water might be contained some pollutants in water such as physical and chemical properties and heavy metal parameter. From the past history, there a lot of reports about water quality by residents. Few of the reports are including “teh klorin” from the resident that stayed at Kuala Lumpur, rusty colour of water from resident that lived at Pulau Pinang, dirt of river water which is the river act as a place for resident do their daily activities and also have reported diarrhea cases due to high level of pollutant in water.

According to South, Region, Pacific, & Regions (2016), heavy metal such as lead is identified as one of ten chemicals that need to be concerned. The possible route for exposure of lead contamination enter the human body is through drinking water. The primary route for lead exist in water is from distribution system which is household plumbing. According to the history for education building such University Malaysia Pahang (UMP)’s college, it can be categorized as old building because some of UMP’s colleges were built around 15 years ago so their water plumbing has potential to exist the lead.

1.4 RESEARCH OBJECTIVES
The aim of this study is to assess the good water quality among students that directly used the water as drinking water at University Malaysia Pahang’ colleges. The main and specific objectives are as following:

1.4.1 Main objective

i. To evaluate the heavy metal, physical and chemical properties in tap water at University Malaysia Pahang (UMP)’s college.

1.4.2 Specific objective

i. To assess the perception of tap water as drinking water among students staying at University Malaysia Pahang (UMP)’s college.

ii. To compare the water quality in term of heavy metal, physical and chemical properties between new and old colleges with standards at University Malaysia Pahang (UMP).

iii. To propose the possible method for the improvement of water quality at University Malaysia Pahang (UMP)’s college.

1.5 RESEARCH QUESTIONS

Research question for this study are as following:

i. Does the parameter of heavy metal, physical and chemical properties in tap water at University Malaysia Pahang’ colleges above the recommended permissible limits for drinking water parameters?

ii. What are the student’s perception of using tap water as a drinking water in University Malaysia Pahang’ colleges?

iii. Does age of the building influence the water quality at University Malaysia Pahang’ colleges?

iv. What are the available methods to increase the water quality at University Malaysia Pahang’ colleges?

1.6 RESEARCH HYPOTHESIS
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