CHAPTER 1:

INTRODUCTION

1.1. Introduction

The human brain consists of 170 billion cells that arise from neurogenesis, that forms the neural tube (Gilbert & Baresi, 2016). The whole process here is regulated by bone morphogenic protein, and later on, the neural tube develops into forebrain, midbrain, and hindbrain. Along with its development, there are some chemicals that cause disruption, and one of the chemicals are bisphenols. This chemical is widely known as a material for making polymers and resins. One of the famous bisphenols used in manufacture is Bisphenol A.

Bisphenol A (BPA; 2,2-bis[4-hydroxyphenyl] propane) is a chemical that presents mostly in plastic and widely used in making of polycarbonates and resins. Synthesized from 2-mole phenols and one-mole acetone (Zielińska et al., 2019), BPA is also a well-known endocrine-disruptor chemical (EDC), and health concern regarding BPA arise due to its ability to mimic estrogen hormone (Nakamura et al., 2006).

Aside from its ability to mimic estrogen hormone, BPA also regarded as an endocrine-disrupting chemical, and also able to induce changes in hypothalamic axis (Richter et al., 2007). The impacts of this axis may lead to changes in the stress response. Furthermore, Bisphenol A is also associated with reproductive failure and cancer (Gilbert & Baresi, 2016). Knowing the harmful effects of BPA, several countries issue a ban for BPA usage in the manufacture of polycarbonates, as well as forbidding it in food and beverage packaging (Eladak et al., 2015).

Aware of this situation, many polycarbonate manufacturers decide to find an alternative for BPA, and the common chemicals for replacing BPA are Bisphenol S (BPS) and F (BPF) (Eladak et al., 2015; Kinch et al., 2015). This study focused on Bisphenol S (BPS) since this chemical is currently used in canned beverages, as well as thermal papers (Viñas et al., 2010; Gallart-Ayala et al., 2011; Becerra and Odermatt, 2012; Liao et al., 2012). Despite its claims of safety compared to BPA, there are not many studies that demonstrate the effect of BPS toxicity, and its possible effect during neurodevelopmental stages, which can impair neuronal structure and differentiation.

1.2. Problem Formulation

From the background, there are several points addressed through this study:

1. Are there any toxicity effects exerted by BPS on brain development?
2. How detrimental is the BPS effect from this study when compared to the existing literature of BPA toxicity?
3. Is BPS a safer substitute for BPA?

1.3. Objective

The objective of this study is to observe any presence of neurodevelopmental toxicity, as well as changes in the brain structure following the exposure of BPS and to compare these effects to the effects of BPA.

1.4. Scope of the Research

The scope in this project consists of mouse handling, exposure of BPS to the mice, removal of the embryos and embryonic brain harvesting. The brains removed will be examined using histology evaluation, particularly using hematoxylin-eosin staining procedure.

1.5. Expected Outcome

It is expected that this study may able to show that BPS can exert toxicity specifically in mice's brain structure development.