EnvironmentAsia
The international journal by the Thai Society of Higher Education Institutes on Environment

EnvironmentAsia 16(3) 2023 178-188
DOI 10.14456/ea.2023.45
ISSN 1906-1714; ONLINE ISSN: 2586-8861

Toxic Effects of Cyclophosphamide on Male Mice Fertility Development and Body Indicators

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Received: March 22, 2023; Revised: April 1, 2023; Accepted: April 20, 2023

Abstract

Chemotherapy is considered one of the crucial strategies for treating cancer. However, a variety of temporary and permanent side effects have been reported due to the use of these chemical compounds. The current study was designed to highlight the influence of cyclophosphamide (CYP) administration on reproductive development capability and fertility in male mice. Thirty pre-mature male mice were divided into three groups; (1) control groups (2) one group injected interperitoneally with 150 mg CYP, and (3) one group with 250 mg CYP. Injections were administered for four weeks. The results indicate a significant reduction in body and organs weights in treated groups when compared with the control group. Similarly, the reproductive capabilities were also decreased in a increasing trend. Zoospermia was detected in treated groups with CYP, and this reduction was more noticable in the 150 CYP group. Luteinizing hormone levels increased significantly in both treated groups while testosterone levels declined considerably in the CYP-treated groups. These findings imply the risks of using this drug in cancer remediation during the maturation period of mice fertility. More investigations are required to detect whether these CYP-associated consequences are reversible or permanent after treatment discontinuation.

Keywords: Cyclophosphamide; Mice fertility; Reproductive ability; Sperm abnormality; Sexual hormones

1. Introduction

Chemotherapy is considered one of the vital steps in cancer treatment via administration of certain classes of chemicals called anti-cancer drugs (Alam *et al.,* 2018). It is well known that these materials are characterize by their distribution capability through the body via the bloodstream; in turn, this characteristic increases the probability of reaching the cancerous tissues throughout the body (Sutradhar and Amin, 2014). In general, the mechanism of action of these materials is focused on growth suppression and killing tumor cells; however, each group of these chemicals involves distinctive mechanism of action (Dasari and Tchounwou, 2014; Meistrich, 2013).

Cyclophosphamide (CYP) is used to treat several types of cancer, such as leukemia, breast, and ovarian in addition to some solid tumors (Gouspillou *et al.,* 2015; Slater *et al.,* 2015). This drug is a nitrogenous mustard belonging to the cytotoxic group of agents (Singh *et al.,* 2018). Primarily, CYP is an inactive chemical compound and requires inactivation by the cytochrome P450 oxidative enzyme (Vredenburg *et al.,* 2015). The main mechanism of action of this material depends on production of alkylating agents whose main role in repressing tumor growth was characterized to be formation of active electrophiles that actively integrate with the DNA structure (Giraud *et al.,* 2010).