

CHAPTER 1
INTRODUCTION

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1.1 Background

World Health Organization (WHO) have stated that smoking had been troubling problem in whole world since a decade ago. Number of smoker in the world is estimated about 1,3 billion people with 4,9% deaths people per year caused by smoking. World Health Organization, and Preventing and Controlling Diseases Centre United State survey that Indonesia is the first place in world rating as a country with the biggest number of men smokers. Cigarette smoke in environment is the main cause of various diseases that can impact to the healthy of nonsmoking people. Based of the report from Ministry of Health of Republik Indonesia (2010) there are causal connections between cigarette consumption with the occurrence of various cancer, heart diseases, systemic respiration diseases, reproductive disturbance diseases and pregnancy disturbance. Those risks are caused by more than 4.000 chemical toxin and 43 of them are substances that cause cancer. The percentage of people that are exposed cigarette smoke mostly in public places, 85,4% people are exposed cigarette smoke in restaurant, 78,4% in their house and 51,3% are exposed in work places (Harahap, 2013). It remains us that the passive smoker get the higher risk to severe lung cancer, cardiac coronary disease, and the other respiratory disturbances than the active smoker. The cigarette smoke exposure which is got intensively by the adult healthy people will add the risks to get lungs diseases and heart disease until 20-30%. Those risks are occurred because passive smokers inhale not only

mainstream smoke from active smoker, but also inhale the side stream smoke. So that, passive smokers inhales toxin that contain in the cigarette smoke more than active smoker (Susanna *et al.*, 2003)

Human body is very susceptible on free radical attack, mainly from free radical inside the body and environment pollutant (Putra, 2008). To support for being survive, there are some enzymes and substances inside the body, that can neutralize free radical, called antioxidant (Kartawiguna, 1998). Even though the lungs have strategically defense mechanism system by inhaling more Oxygen when the respiration process, increasing cigarette smoke around can cause damage of lungs tissue (Arkeman, 2006).

As the organ that hold the main system of respiratory, lungs spontaneously control the inhalation and exhalation process. So that, the lungs is the first organ that can be exposed easily and susceptible to the disturbances of cigarette smoke. It gives the impact to the activities of the cells work on pulmonary immune system that defenses any pathogens, pollutants, and particles inhaled, such as great alveolar cells (type II cells) in large surface area of alveolar that provide the defense mechanism by secretion of pulmonary surfactant. (Eleni *et al.*, 2007)

Antioxidants are needed to protect type II cells amounts from decreasing as the impact of free radical from cigarette smoke substances inhaled to the body. Natural antioxidants that is already known is *Hibiscus sabdariffa calyx*, that is commonly known as Rosella (Al Kennany *et al.*, 2010).

1.2 Statement of Problem

According to the background, the formulation of problem from this research is, can the aromatherapy extract of *Hibiscus sabdariffa* calyx decrease type II pycnotic cells at intralveolar septa of mice caused by effect of cigarette smoke?

1.3 Theoretical Base

Smoking habit will damage the defense mechanism of lungs that is called mucocilliary clearance. Beside that, cigarette smoke increases airway resistance and causes blood vessel in lungs leak easily, occur the increasing of capillary endothel permeability, so that, causes plasma protein out with the liquid and buried in tissue and cause edema. Cigarette smoke is also known as a cause decreasing of antigen response, so that, if there is a foreign body enter to the lungs, it will not be known, so there will not be a response directly (Aditama, 2003).

The lung is exposed continuously to inhaled pathogens, pollutants and particles. Therefore, the pulmonary immune system needs to provide defense mechanism against harmful pathogens and to prevent inappropriate inflammatory response. Several defense mechanism contribute to the innate immunity of the lung, including filtration in the naso-oropharynx, sneezing, coughing, mucocilliary clearance, opsonins (Ig), innate immune cells (AM, Neu), and surfactant proteins (SP) (Eleni G. *et al.*, 2007).

Type II cells function in the synthesis and secretion of surfactant that reduces the surface tension of the alveoli. Increasing level of necrosis in type II

pneumocyte causes a decrease in the synthesis and secretion of surfactant, which can cause the collapse of the alveoli and decrease in lung development, causing shortness of breath and pain when breathing because of the friction between the alveoli (Nur *et al.*, 2002).

Pulmonary surfactant is a unique and complex mixture of lipids (85-90%) and specific proteins (10%) that constitutes the mobile liquid phase covering the large surface area of the alveolar epithelium. It maintains minimal surface tension within the lungs in order to avoid lung collapse during respiration. Recent studies have shown that SPs also function in the pulmonary host defense as immune mediators. The components of surfactant are synthesized within the lung in the alveolar type II cells, Clara cells and submucosal cells (Eleni G. *et al.*, 2007).

Preventing the effect of cigarette smoke that contain free radicals contribute to oxidative stress, individual assessment of susceptibility becomes important. Antioxidants are capable of stabilizing, or deactivating free radicals before attacking cells (Mark Percival, 1998). They act at the level of prevention, interception and repair. Preventive antioxidants attempt to stop the formation of Reactive Oxygen Species (ROS). These include superoxide to H_2O_2 and catalase that breaks it down to water. Interception of free radicals is mainly by radical scavenging, while at the secondary level scavenging of peroxy radicals are effected. The effectors include various antioxidants like vitamin C and E, glutathione, other thiol compounds, carotenoids, flavonoids, etcetera. At the repair and reconstitution level, mainly repair enzymes are involved.

In normal healthy human body, the generation of pro-oxidants in the form of ROS and Reactive Nitrogen Species (RNS) are effectively kept in check by the various levels of antioxidant defense. However, when it gets exposed to adverse physicochemical, environmental or pathological agents such as cigarette smoke, this delicately maintained balance is shifted in favor of pro-oxidants resulting in 'oxidative stress'. It has been implicated in the etiology of several (>100) of human diseases and in the process of ageing (Devasagayam, 2004).

Based on the theory, this research focus to identify the number of great alveolar cells (type II cells) from the treated organ in order to know the relation and effects of cigarette smoke exposure to the intralveolar septa and *Hibiscus sabdariffa* calyx extract as the treatment that have high content of Antioxidant to against free radicals from cigarette smoke.

1.4 Research Purpose

1.4.1 General Purpose

Based on the problem, the general purpose of this research is to prove that aromatherapy extract of *Hibiscus sabdariffa* calyx can act as an antioxidant which protect the passive smokers from the free radicals of cigarette smoke.

1.4.2 Specific Purpose

In order to prove that aromatherapy extract of *Hibiscus sabdariffa* calyx can decrease type II pycnotic cells at intralveolar septa of mice caused by effect of cigarette smoke.

1.5 Outcomes Research

- a. The general public, to provide an overview and understanding about the toxin effect of cigarette smoke to the body if it is exposed intensively and the potential of herbal therapy through inhaled aromatherapy.
- b. Veterinary World, to provide an overview and understanding to the pet owners about the risk factors of bad air pollution, so that the owner can realize to provide a health environment around the living place.
- c. The Ministry of Health and other relevant agencies, it is expected that this research can be reference to prevent complication and reduce mortality from respiration disturbances.
- d. This study may also be useful as references or comparison for subsequent researchers, especially for the development of scientific research.

1.6 Hypothesis

The aromatherapy extract of *Hibiscus sabdariffa* calyx can decrease type II pycnotic cells at intralveolar septa of mice caused by effect of cigarette smoke.