

CHAPTER 1 INTRODUCTION

1.1. Background

The use of cigarettes in the world is increasing every day. Smoking is the activity of inhaling and exhaling smoke from burning tobacco in various ways. As one of the middle-income countries, Indonesia has 34.7% of grown-up smokers and this figure contributes to 51% of smokers among the Association of Southeast Asian Nations (ASEAN) countries, making Indonesia the second largest global cigarette market (Gibson, 2017). Consuming cigarettes has become a common thing and even postulated as a sign of a person's maturity. The development of this mindset causes the number of smokers to increase (Fitria *et al.*, 2013). Health problems caused by smoking come from the main smoke and side smoke from burning cigarettes. Side acids contain a higher toxic content than the main smoke, making it dangerous for people around the cigarette smoke environment.

Each cigarette burned, it will produce around 4000 kinds of chemicals that are toxic, such as carcinogens, tar, nicotine, nitrosamines, carbon monoxide, PAH compounds (Poly-nuclear Aromatic Hydrogen), phenols, carbonyl, chlorine dioxins and furans (Sukmaningsih, 2009). Smoking plays an important role in the pathogenesis of destruction in the lung parenchyma and inflammation of the airways (Zhao a *et al.*, 2010). Exposure to cigarette smoke can form free radicals in the body. Free radicals are unpaired electrons and will keep trying to find their electron pairs so that they become stable. If the electron does not get a partner, it will continue to move looking for an electron pair so that it forms a chain reaction.

This can cause cell damage and destroy DNA in cells thus accelerating the onset of cancer and many other health problems (Pham Huy *et al.*, 2008). Free radicals that come from cigarette smoke cause damage to the lungs due to continuous exposure to pollutants. The lungs are vital respiratory organs in the human body which are directly affected when a person is exposed to cigarette smoke (Eisner, 2009). The damage to the lungs is caused by oxidative stress to the tissues and lung cells caused by cigarette smoke which can cause changes and even damage to the histological structure of the lungs, damage to lung function and cell death in the lungs. Oxidative stress is caused by high concentrations of ROS (reactive oxygen species) due to exposure to cigarette smoke, causing conditions for antiprotease inactivation, airway epithelial damage, mucus hypersecretion, increased neutrophil influx to lung tissue, and increased infiltration of inflammatory mediators (TNF- α , IL-8, macrophage inflammatory protein-1 α (MIP1- α), monocyte chemoattractant protein-1 (MCP-1), T lymphocytes, CD8 + cytotoxic cells along with IL-4 and IL-3) which can then exacerbate the situation cells and tissues that have been damaged (Daijo *et al.*, 2016; Oktarlina, 2017).

The effects of free radicals in the body will be neutralized by antioxidants. The human body can actually produce antioxidants but the amount is often not enough to neutralize free radicals that enter the body (Hariyatmi, 2004). Antioxidants are molecules that can donate electrons to free radical molecules, thereby stopping the chain reaction (Inggrid, 2014).

Inflammation is the body's response to harmful stimuli caused by various harmful agents such as infection, antibodies or physical injury (Goodman and Gilman, 2006). Anti-inflammatory effects have been observed in flavonoids and tannins. Flavonoids are known to be effective in reducing acute inflammation (Kumar *et al.*, 2012).

Indonesia has many types of plants that can be cultivated because they are beneficial and of great use to humans in terms of medicine. In plants there are many chemical components that can be used as medicine. Medicinal plants are an important source of therapeutic aid to alleviate ailments suffered by humans. About 80% of people living in developing countries depend on traditional medicine for their main treatment. Interestingly, 85% of these traditional medicines are extracts from plants (Mahmood *et al.*, 2014). Based on the results of phytochemical screening, the ethanol extract of aromatic ginger rhizome was detected to contain flavonoids, polyphenols, tannins, steroids, monoterpenes and sesquiterpenes (Hasanah *et al.*, 2011). According to research (Hayati *et al.*, 2015) which have proven that aromatic ginger contains flavonoid and polyphenol compounds which act as anticancer, antioxidant, anti-inflammatory, allergy and antihypertensive. Extract from aromatic ginger rhizome has anti-inflammatory, analgesic, nematocide, mosquito repellent, larvicide, vasorelaxant, sedative, antineoplastic, antimicrobial, antioxidant, allergy, and wound healing activity (Umar *et al.*, 2011). There has been no research that discuss the activity of aromatic ginger to assess its protective effect to a lung that has been induced by cigarette smokes and evaluated in histopathology imaging. This research aims to

find an efficiency of aromatic ginger as a protective effect from damaged lung caused by cigarette smokes.

1.2. Formulation of the Problem

Based on the background, the formulation problem of this research is whether aromatic ginger (*Kaempferia galanga L.*) extract provide a protective effect against histological damage to the lungs of male mice exposed to cigarette smoke?

1.3. Theoretical Basis

Smoking is a problem that has not been resolved until now. Various impacts and dangers of smoking have actually been published to the public, but the public's smoking habit is still difficult to stop. The dangers of smoking are not only for smokers but also on the people around them (passive smokers) (Hasanah, 2011). Every single cigarette that is burned, will release about 4000 kinds of chemicals. In general, these materials can be divided into two groups, namely the gas component and the solid component. Gas components include carbon monoxide, carbon dioxide, nitrogen oxides, ammonia, hydrogen cyanide, cyanogens, sulfur compounds, aldehydes, and ketones. Solid components in the form of tar and nicotine. Among these materials, the main toxic components in cigarette smoke are carbon monoxide, nicotine and tar (Nururrahmah, 2014). Tobacco tar or sap is a mixture of several hydrocarbon substances. Nicotine is the largest component in cigarette smoke and is an addictive. Carbon monoxide is a poisonous gas that has a strong affinity for hemoglobin in red blood cells to form carboxyhemoglobin (Nururrahmah, 2014).

The compounds in cigarette smoke are toxic such as carcinogens, tar, nicotine, nitrosamines, carbon monoxide, Polynuclear Aromatic Hydrocarbons (PAH), phenols, carbonyl, chlorine dioxins, and furans (Eriksen, Mackay and Ross 2012). In addition, cigarette smoke also contains acetaldehyde, acrolein and nitric oxide. Acetaldehyde and acrolein have an effect on the epithelial cells of bronchioles and alveoli causing an inflammatory response (Aishiba and Nakai, 2003). One alternative to natural ingredients that contain antioxidants is aromatic ginger rhizome. According to (Hayati *et al.*, 2015) in aromatic ginger rhizome there are chemical substances that can affect antioxidant activity such as flavonoids and polyphenols.

1.4. Research Purpose

This study aims to determine the protective effect of aromatic ginger (*Kaempferia galanga L.*) extract on the histological damage of male mice lungs exposed to cigarette smokes.

1.5. Benefits of Research

1.5.1. Theoretical Benefits

- a. Provides scientific information regarding the protective effect of aromatic ginger (*Kaempferia galanga L.*) extract against histological damage to the lungs of male mice exposed to cigarette smokes.
- b. As a consideration for further research, for example research with human subjects.

1.5.2. Applicative Benefits

Providing scientific information to the public regarding the benefits of aromatic ginger (*Kaempferia galanga L.*) extract as lungs protection from the effects of exposure to cigarette smokes.

1.6. Research Hypothesis

Supported by that statement, a hypothesis emerged that the effect of aromatic ginger (*Kaempferia galanga L.*) could provide a protective effect against the histological damage of male mice lungs exposed to cigarette smokes.