CHAPTER 1

INTRODUCTION

1.1 Background

Soybean represents one of the most valued oilseed crops in the world. Being cultivated more than 5000 years ago in China, it has been used for various purposes in different parts of the world. Nowadays, it is mainly cultivated to extract oil. By means of biological nitrogen fixation (BNF), it contributes to soil fertility, lesser pest and disease incidence (Qiu and Chang, 2010). Being an important nitrogen-fixing crop that supplies much of the world's protein and oil, soybean is the major source of seed meal used in animal feed. Actually, it contains the largest amount of protein among ordinary food source which includes meat, fish and cheese (Cooper *et al*., 2008).

In many developing countries, in order to aid improvement of the diet, soy products are used. This includes soy flour, soy protein and soy milk. These products not only supply protein and calories but also micronutrients. It has been shown that soybeans are a good source of nutritional iron which distribution may depend on genotype though (Cvitanich *et al*., 2009).

Soybean contains a variety of biologically active compounds like saponins, lunasin and isoflavone. Among them, isoflavones draw attention of scientific community. Although isoflavones have limited distribution in nature, they are found relevently rich amount in soybean and red clover. Isoflavones can perform a wide range of biological functions. They are

classified as both phytoestrogens and endocrine disruptors (Messina, 2010). Phytoestrogens function primarily as female sex hormone estrogens. These plant-derived compounds are not generated within the endocrine system but consumed by eating plants (Yildiz, 2005).

Endocrine disruptors are a class of chemicals that act as agonists and antagonists of a number of receptors like estrogen receptors, androgen receptors, thyroid hormone receptors and others (Vandenberg, 2009). They could cause disorders of the reproductive system.

It has been shown that giving a diet high in phytoestroges in adult rats would interfere with spermatogenesis and increase germ cell apoptosis. (Assinder *et al*., 2007) Meanwhile the mentioned diet could cause a significant decrease in plasma testosterone without any effect on the levels on lutenizing hormone (LH) (Weber *et al*., 2001). Indeed, the low level of testosterone, impaired spermatogenesis and increased apoptosis will affect fertility. The epididymis relies on testosterone to maintain its structure and functions. Low levels of testosterone will result in decrease content of endoplasmic reticulum, loss of apical microvilli from their surface, lysosome accumululation, vacuolization and increased endocytosis (Robaire, Hinton and Orgebin-Crist, 2006). As the epididymis is important for sperm viability and sperm motility, these abnormalities might significantly affect male infertility (Arroteia *et al*., 2012).

Administration of an isoflavone called genistein (2.5 and 5.0 mg/kg/day, p.o) affects male reprodutive development in mice, resulting in a

slight decrease in sperm count (Lee *et al*.,2004). However, another study done by Jung et al. (2004) showed that feeding genistein (2.5mg/kg/day) may not affect male reproductive development and functions in mice. Therefore, it is debatable whether a diet high in phytoestrogens could affect male reproductive organs and functions. Based on the inconsistent trials, it is neccessary to study further the effect of phytoestrogens on epididymis.

1.2 Statement of the Problem

On the basis of the background above, the research problem is formulated as follows:

Does soy milk have an effect on epididymal epithelial vacuolization in Wistar rats if it is given from the age of six weeks until eighteen weeks ?

1.3 Objectives of the Research

1.3.1 General Objective

To observe the effects of soy milk towards the vacuolization of epididymal epithelium of male Wistar rats fed with soy milk since the age of six weeks until eighteen weeks.

1.3.2 Specific Objective

- To approve no vacuolization of the epithelium cells in the epididymis in male Wistar rats fed with normal diet.

- To approve vacuolization of the epithelium cells in the epididymis in male Wistar rats fed with soy milk.
- To know the correlation between different dosages of soy milk and appearance of cells with vacuoles in epididymis in male Wistar rats fed with soy milk.

1.4 Significance of the Research

The outcomes of the present research are expected to:

- To give knowledge of the effects of the use of soy milk within the Indonesian medical society.
- Gain knowledge about the effect of soy milk which contains the least amount of isoflavones among soy foods.
- To add the information about the study of soy milk influence on the vacuolization of epididymal epithelial in male Wistar rats for researchers.
- To give information to the public about the effect of soy foods on the male reproductive functions and fertility.