1. INTRODUCTION AND OBJECTIVES

1.1. Introduction

Sheep and goats form the most important group of milk producing animals after dairy cattle in both temperate and tropical agriculture (Devendra and Coop, 1982). The dairy goat industry is rapidly gaining in importance throughout the world (Hoscos et al., 1996).

More than any other mammalian farm animal, the goat is a main supplier of dairy and meat products for rural people, especially in developing countries. As a dairy supplier, the goat can accomplish one of the three aspects of the demand for goat milk: home consumption. This demand is increasing because of the growing populations of people, and here the old saying of the “goat being the cow of the poor people” is quite fitting. The second aspect of the demand for goat milk is the special interest in goat milk products, especially cheeses and yoghurt, in many developed countries. This demand is growing because of the increasing levels of disposable incomes. The third aspect of the demand for goat milk derives from the affliction of people with cow milk allergies and other gastro-intestinal ailments. This demand also is growing because of a wider awareness of problems with traditional medical treatments to such afflictions, especially in developed countries. These two latter aspects of the demand for goat milk are quite different from the “goat being the cow of the poor people”; here, goat milk is wanted or even needed by people of all income levels (Haecklein, 2004).

Milk is a nutritious food for human beings, but it also serves as a good medium for the growth of many microorganisms, especially bacterial pathogens. Lactococcus, Lactobacillus, Streptococcus, Staphylococcus and Micrococcus spp. are among the common bacterial flora of fresh milk (Chye et al., 2004). The importance of various etiological agents in milkborne disease has changed dramatically over time. However, more than 90% of all reported cases of dairy-related illness continue to be
of bacterial origin, with at least 21 milkborne or potentially milkborne diseases currently being recognized (Bean et al., 1996).

Zweifel et al. (2005) stated that goats and sheep rank third and fourth in terms of global milk production from different species. But unlike cow milk, which has stringent hygiene and quality regulations, microbiological standards for the production and distribution of goat milk and sheep milk are more relaxed (Klinger and Rosenthal, 1997).

According to FAO (2006), Indonesia was ranked as the 14th in producing goat milk globally and ranked as the 1st in the Southeast Asia region in 2005. It was estimated to produce around 220,000 metric tons (MT) of goat milk. In 2005, the goat population in Indonesia was 13,182,000 head in total, out of that West Java province was ranked the 3rd in the country with 1,235,973 head of goat (DGLS, 2005). On the one hand, unlike cow’s milk, hygiene and quality regulations for production and distribution of small ruminant’s milk, such as goat milk are more relaxed in Indonesia and are not subject to specific microbiological standards in a legal sense. So far this product has less attention in terms of quality and safety control from farmer organizations and/or government institutions than those for cow’s milk and milk products. On the other hand, most of the consumers prefer to drink raw goat milk due to their belief in the benefit of raw goat milk as a health promoting agent, or even disease-relief agent.

Investigation on the microbiological quality such as Total Plate Count (TPC), coliforms and the presence of pathogenic bacteria of goat milk together with some risk factors affecting these microorganisms in Indonesia was very rare. In view of food hygiene and consumer health as well as animal health protection, however, evaluation of the microbiological status and presence of pathogenic bacteria in goat milk, which can cause adverse health effects on the animals as well as pose a high risk of causing foodborne disease in humans, is of central importance.

The presence of microorganisms in milk and milk products has important ramifications for safety, quality, regulations and public health. TPC is the first and
principal tool used by technicians and farmers to evaluate the efficiency of production processes, cleaning and sanitation practices and to predict the keeping quality and shelf life of milk (Gonzalo et al., 2006). Jayarao and Wang (1999) stated that milk from the farm can become contaminated with Gram negative bacteria present on teats, teat ends, teat canal, udder surfaces, mastitic udders and contaminated water used clean the milking systems and those that are resident in the milking system. Gram negative organisms associated with milk quality can be placed into two groups, coliforms and non coliforms. Both groups are responsible in lowering milk quality and have significant concern on public health importance (Jayarao and Wang, 1999).

*Staphylococcus* spp. are the main aetiological agents of small ruminant’s intramammary infections (IMI), the more frequent isolates being *Staphylococcus aureus* (coagulase-positive staphylococci [CPS]) in clinical cases and coagulase-negative staphylococci (CNS) in subclinical IMI (Bergonier et al., 2003). *Staphylococcus* spp. can be found widely distributed in animals, and it is a contagious pathogen that can be transmitted from doe to doe during unhygienic milking procedures. High prevalence of CPS such as *S. aureus*, or CNS can be of veterinary public health concern. Both groups of bacteria are important zoonotic bacterial pathogens, which can also be transmitted to humans through goats’ raw milk and cause food poisoning associated with enterotoxin production (Wakwoya et al., 2006).

1.2 Objectives

The objectives of this study were (i) to investigate the microbiological quality of raw goat milk by using TPC and coliforms as indicators (ii) to investigate the presence of *Staphylococcus* spp. (coagulase positive and negative staphylococci) in raw goat milk, and (iii) to evaluate the potential risk factors associated with them in dairy goat farms in the Bogor District, West Java Province, Indonesia.
Significance and impact of the study

It was expected that the result of this study would provide a primary scientific database for the microbiological quality of raw goat milk in Indonesia, and some potential risk factors associated with it. Moreover, the baseline information from this research could be used by the related stakeholders in formulating intervention programs for assisting the farmers to improve their systems in keeping animals and the quality and safety of their product, as well as in designing further studies aimed in setting up preventive measures against the introduction of pathogenic agents into the animal and its product.