Chapter 1

Introduction

1.1 Statement and significance of the problem

In recent years, intensive livestock and poultry rearing practices have led to an increase in animal stress and incidence of disease. Intestinal infections are becoming increasingly prevalent in commercially-bred chickens and are inflicting severe economic losses on the poultry industry. One disease of particular concern is Coccidiosis. In year 2004, coccidiosis in Thailand was reported by World organization of animal health (OIE) to have caused 16 outbreaks, 2726 cases and 489 deaths. Coccidiosis is recognized as the parasitic disease that has the greatest economic impact on poultry production. The annual worldwide cost is estimated to be approximately $800 million (Williams, 1998).These estimates include the costs of prophylactic in-feed medication for broilers and broiler-breeders, alternative treatments (e.g., with amprolium) if the medications fail, and losses due to mortality, morbidity, and poor feed conversions of birds that survive outbreaks.

Chickens are susceptible to at least 11 species of coccidia. As a group, coccidia of the genus *Eimeria spp.* cause the most widespread health problems in the broiler industry and remain one of the most expensive diseases of commercial poultry production (Edgar, 1992; Henken et al.,1994; Yun et al.,2000). The most common species are *Eimeria tenella*, which causes the cecal or bloody type of coccidiosis, *E.*

necatrix, which causes bloody intestinal coccidiosis, and *E. acervulina* and *E. maxima*, which cause chronic intestinal coccidiosis (Murray, 2001).

Chickens are infected by coccidial parasites through the fecal-oral route, and immunity is achieved once the parasite completes its life cycle within the host. Once the coccidial oocyst is ingested, *Eimeria spp.* parasites penetrate enterocytes along the digestive tract at specific regions of the gut depending on the parasite species. Initial invasion is followed by subsequent parasite development, and severe damage to the intestinal lining occurs. This disruption of the mucosa leads to decreased nutrient absorption, increased feed conversion ratios, decreased weight gains, lethargy, diarrhea, and in severe cases, mortality. Historically, coccidial parasites have been controlled through the use of in-feed coccidiostats. However, through the years, drug-resistant strains of *Eimeria spp.* have emerged, which hinder the efficacy of the presently used coccidiostats.

Currently, chemotherapy is used extensively to control coccidiosis, but has been complicated by the emergence of drug resistance in field strains of parasites mandates development of alternative methods to control this disease. Immunological and molecular control strategies now appear to be suitable to achieve this goal (Yun et al., 2000).

The interaction between the *Eimeria spp.* and the intestinal mucosal immune system is a key component to the defense against to these enteric pathogens. Once the bird ingests the viable oocyst(s), a cascade of events occurs involving both nonspecific and specific defense mechanisms of immunity (Lillehoj and Lillehoj, 2000). It is well established that B and T-lymphocytes are involved in responses to *Eimeria spp.* invasion and mast cell responses contribute to adaptive immunity in mammalian parasitic infections (Rose, 1982; Abraham and Arock, 1998), but their involvement in chickens has been largely overlooked.

In chickens, those previously unexposed to *Eimeria spp.*, coccidial infections induce a variety of pathological and immunological responses, which help the host defend against the parasite and acquire protective immunity. However, the level of protection each facet of the immune system provides may vary with the developmental stage of the parasite (Rose, 1987). Prior to the generation of a specific immune response, the host tries to exclude the *Eimeria spp.* through non-specific immune pathways such as competitive exclusion by normal flora, lysozymes, increased gastric secretions, and peristalsis to quickly flush parasites from the digestive tract (Lillehoj and Lillehoj, 2000; Yun et al., 2000). However, it has been reported that these innate defenses as well as specific immunologically mediated defenses play a role at the intestinal mucosal surface during *Eimeria spp.* invasion (Lillehoj and Trout, 1993). Therefore, host probably does not eliminate the parasite utilizing only nonspecific pathways, but infection can be controlled to a certain degree prior to the completion of the *Eimeria spp.* life cycle and generation of a specific immune response.

Probiotics are biological products, which can improve the animal's growth performance (Kyriakis et al. 2003) as well as increase the body's resistance to the infectious agents by equilibrating body microflora, stimulating the immune system by increasing the number of antibodies and increasing the effectiveness of macrophages (Goldin and Gorbach,1984 and Francis et al. 2002). Furthermore, they are natural, harmless bacteria and have no drug residues in edible animal products after being fed to the animal.

Despite the fact that several studies have shown disease prevention or immune enhancement resulting from oral administration of probiotics (Koenen et al., 2004; Yurong et al, 2005; Ogawa et al., 2006) , little information has been reported regarding their specific effects on gut defense mechanisms in chickens. Dalloul et al. (2003) showed increased resistance in Lactobacillus-treated broilers to *Eimeria acervulina* (EA), as manifested by reduced shedding of fecal oocysts and Dalloul et al. (2005) also found a positive impact of the probiotic on cellular immune responses of infected broilers.

The aim of this study was to isolate and identify probiotic lactic acid bacteria and further evaluate its effect on productive performance, the inhibition of *E. tenella* infection and immunity in male broilers.

1.2 Purposes of the study

1.2.1 To isolate and identify probiotic lactic acid bacteria from poultry's coacal swap

1.2.2 To evaluate the effect of selected probiotic bacteria on productive performance and humoral immunity in male broilers

1.2.3 To evaluate the effect of selected probiotic bacteria on inhibition of *E. tenella* infection

1.2.4 To evaluate the effect of selected probiotic bacteria on anti-coccidial antibody and cytokine levels related with *E.tenella* infection