

# CHAPTER I

## INTRODUCTION

### 1. Background

*Neospora caninum* is a cyst-forming parasite which was detected in 1984 (Bjerkås et al., 1984) and named in 1988 (Dubey et al., 1988). The parasite is closely related to *Toxoplasma gondii*, but they are distinct in both ultrastructure and antigenicity (Speer et al., 1999). *N. caninum* can infect a variety of animal species, and is now recognized as the most important cause of bovine abortion worldwide. Tremendous economic loss in the cattle farming industry due to *N. caninum* infection has been reported (Hasler et al., 2006a). In the dairy cattle, prevalence of *N. caninum* infection at the individual level has been found up to 87% (Stenlund et al., 2003) while that in beef cattle was usually less than 30% (Dubey et al., 2007a). Prevalence of the infection could be detected in 94% investigated cattle herds (Woodbine et al., 2008). The infection of the parasite in buffaloes has also been reported in several countries. The proportions of infected river buffaloes were from 35% to 71% (Campero et al., 2007; Dubey et al., 1998; Gennari et al., 2005; Guarino et al., 2000; Mohamad et al., 2007) while those in the swamp buffaloes ranged from 0% to 2% (Huong et al., 1998; Konnai et al., 2008; Yu et al., 2007).

In the cattle, the most important route of *N. caninum* infection is transplacental transmission in which the parasites transmit from the dams to their calves through the placenta. Up to 95% calves born to the infected dams are clinically healthy but persistently chronically infected (Davidson et al., 1999; Schares et al., 1998). Transplacental transmission is described in two forms, i.e. exogenous and endogenous (Tree and William et al., 2005). Exogenous transplacental transmission occurs when the naïve cattle ingest the infective oocysts, and the sporozoites differentiate to the tachyzoites that can cross the placenta and infect their offspring during pregnancy. On the other hand, endogenous transplacental transmission is the result of a reactivation of the existing persistent infection within the cows during the gestation. The postnatal transmission occurs when cattle become infected with *N. caninum* after ingestion of the

oocysts shed from the definitive hosts, i.e. dogs (McAllister et al., 1998a), coyotes (Gondim et al., 2004) and Australian dingoes (King et al., 2010). This route of infection is less effective than the transplacental transmission because its frequency is below 5% (Bartels et al., 2007a; Chanlun et al., 2007; Davison et al., 1999; Hietala and Thurmond, 1999). *N. caninum* infection can survive within the herds for years and cause the abortion in consecutive pregnancies (Davidson et al., 1999).

Several tests can be used for demonstration of *N. caninum* infection in the animals. Cell culture, bioassay are the definitive approaches to demonstrate the presence of the parasite in the infected animals (Regidor-Cerrillo et al., 2008; Rojo-Montejo et al., 2009). Polymerase chain reaction (PCR) is also employed in the *N. caninum* infection diagnosis with high sensitivity and specificity (Wang et al., 2009; Yao et al., 2009). Presence of specific antibodies to *N. caninum* indicates that the individual is infected with the parasite. Serological tests are widely used to demonstrate antibodies to *N. caninum*, and ELISAs are the most frequent tools for epidemiological study due to less time-consumption, and a large number of samples can be tested at the same time. Sera and milk are common samples applicable for analysis using such serological tests (Chanlun et al., 2007; Frössling et al., 2006; Garcia-Vazquez et al., 2009; Yao et al., 2009).

In Thailand, *N. caninum* infection in dairy cattle has been reported in different parts of the country. Studies have shown the presence of *N. caninum* infection at both the individual and herd levels. The prevalences of infection at the individual dairy cows were from 5.5% to 70% (Chanlun et al., 2002, 2006b; Kashiwzaki et al., 2001; Kyaw et al., 2004; Suteeraparp et al., 1999), and the herd prevalences were reported to be 25% to 57% (Chanlun et al., 2002, 2006b). The *Neospora*-associated abortion in both dairy and beef cattle has also been suggested since high proportions of investigated beef and dairy cattle in the aborted herds were found seropositive, i.e. 61.8% and 40.2%, respectively (Charoenchai et al., 2000).

Swamp buffaloes and beef cattle are two important domestic livestock in Thailand. In 2009, the total population of swamp buffaloes and beef cattle are 1.4 million and 8.6 million heads, respectively (DLD, 2009). The numbers of these two species in Northeast regions contributed large proportions to the total population of swamp

buffaloes and beef cattle in the country for years. During 1998 to 2009, swamp buffaloes and beef cattle in Northeast of Thailand respectively accounted for 74% to 84% and 44% to 55% in the whole population of these two livestock of the country (DLD, 2008, 2009). Despite of the significant impact on the economy of Thailand, especially on the living of farmers in Northeast, there are no reports about *N. caninum* infection in swamp buffaloes, and information about this disease in beef cattle is still limited. Understanding of *N. caninum* infection in swamp buffaloes is essentially required to accomplish the prevention and control measures of the disease.

## **2. Objectives of the study**

The overall goal of this study was to obtain a better understanding of *N. caninum* infection in swamp buffaloes in Northeast Thailand.

The specific objectives of the study were:

1. To investigate the prevalence of *N. caninum* infection in swamp buffaloes in Northeast Thailand.
2. To study the effects of *N. caninum* infection on the fertility of artificially inseminated swamp buffaloes.
3. To study the prevalence of *N. caninum* infection in swamp buffaloes and beef cattle reared in the same area.
4. To demonstrate the *N. caninum* DNA in the swamp buffalo whole blood.

## **3. Anticipated outcome**

All the knowledges gained from the research will provide a better understanding of the *N. caninum* infection in swamp buffaloes in Thailand. The information will be useful for epidemiological study, prevention and control measures of the *N. caninum* infection in the country.