CHAPTER 1

INTRODUCTION

Streptococcus suis, an important pathogen of swine and human, causes a wide range of diseases including meningitis, septicemia, endocarditis, arthritis, and toxic shock syndrome (Staats *et al*., 1997; Tang *et al*., 2006). Meningitis, which related to hearing loss, is the serious symptom of patients infected with *S. suis* followed by toxic shock syndrome which is the major cause of sudden death in a high mortality (Tang *et al*., 2006; Yu *et al*., 2006). Moreover, *S. suis* can cause several clinical signs such as fever, headache, vomiting, coma, stiff neck and skin findings (Tang *et al*., 2006; Mai *et al*., 2008). *S. suis* is colonized in healthy swine nasal cavities, tonsils and upper respiratory but colonization in genital and alimentary tracts of pigs slaughtered have been reported (Robertson and Blackmore, 1989). Infection with *S. suis* has been become a serious zoonosis. They are transmitted from healthy or diseased swine to human via direct contact with swine or contaminated pork (Staats *et al*., 1997; Francois *et al*., 1998; Marois *et al*., 2007).

Outbreaks of *S. suis* have occurred in several countries worldwide, most cases have been reported from China, Vietnam, and Thailand, respectively as well as from European countries, which they are many pigs industries such as the Netherlands and Germany (Wertheim *et al*., 2009a; GeoNetwork, 2005). In Thailand, two first cases of *S. suis* infected patients have been reported from Ramathibodi Hospital in 1987 (Phuapradit *et al*., 1987). Subsequently, several cases have been reported, particularly in the northern part. Two outbreaks have occurred in Lamphun and Phayoa provinces

in 2001-2002 and 2007, respectively (Fongcome *et al*., 2002; Khadthasrima *et al*., 2009). In Chiang Mai province, 41 isolates of *S. suis* were identified from patients in Maharaj Nakorn Chiang Mai Hospital between 2000-2002 (Wangkaew *et al*., 2006) and 40 cases of *S. suis* infection have been reported between 2003-2007 (Navacharoen *et al*., 2009). Lately, 179 *S. suis* isolates have described in Thailand between 2006 and 2008. Specimens of these strains were collected from 34 hospitals in 25 provinces of Thailand (Kerdsin *et al*., 2011).

Recently, *S. suis* has been classified into 33 serotypes based on variation in the capsular antigen (Gottschalk *et al*., 1999; Hill *et al*., 2005). *S. suis*, especially serotype 2 has been reported as the most commonly associated with diseases in swine and human worldwide (Wisselink *et al*., 2000; Hill *et al*., 2005). In Asia, 2 large outbreaks of *S. suis* serotype 2, caused toxic shock syndrome in human were reported in China between 1998 and 2005 (Tang *et al*., 2006). In European countries, serotype 9 has been reported as the most common in swine in the Netherlands and Germany and serotype 1 and 14 in suckling piglets in United Kingdom (Wisselink *et al*., 2000; Baums and Valentin-Weigand, 2009). Currently, 19 human cases worldwide had been attributed to serotype 14 that included 13 human cases in Thailand (Kerdsin *et al*., 2009). Of important, *S. suis* serotype 14 is occurrence as sporadic infection, particularly in northern Thailand. Therefore, human cases caused by *S. suis* serotype 14 were becoming the more common infection in Thailand (Kerdsin *et al*., 2009). Other serotypes infected in human as sporadic cases have been reported for example 1 fatal case of serotype 16 in southern Vietnam and 1 case of serotype 4 from meningitis patient in the Netherlands (Arends and Zanen, 1988; Nghia *et al*., 2008).

Recently, serotype 5 and 24 have been reported as first cases of these serotypes in Thailand (Kerdsin *et al*., 2011).

S. suis is a gram positive coccoid or ovoid, arranged in pair or short chains. Colony characteristic of *S. suis* is small, grayish, mucoid and alpha-hemolysis (Gottschalk *et al*., 1989). *S. suis* is usually identified by morphological and biochemical characteristics. *S. suis* serotype is usually classified by serological test based on polysaccharide specific antigen (Hommez *et al*., 1986; Gottschalk *et al*., 1989; Higgins *et al*., 1995). However, many laboratories in Thailand rarely have routine biochemical test for *S. suis* and generally, it requires 3 to 4 days to identify *S. suis*. Although *S. suis* can be cultured and identified from CSF or blood samples, misidentification as *Streptococcus* species, alpha-hemolytic or viridans streptococci, *E. faecalis*, *Aerococcus viridans*, or *S. pneumoniae* always occur (Donsakul *et al*., 2003; Higgins *et al*., 1990; Lutticken *et al*., 1986) and culture results may be negative because of pretreatment with antibiotic before sample collection (Kerdsin *et al*., 2009; Nga *et al*., 2011).

In addition, capsule polysaccharide of *S. suis* may be lost during subculture, and subsequently cause the misidentification by coagglutination test with specific anti-sera (Higgins and Gottschalk, 1990). Thus, PCR technique used to detect and identify *S. suis* serotypes. For example, PCR technique based on 16S rRNA and glutamate dehydrogenase (*gdh*) genes were used as target for *S. suis* detection in swine and human (Okwumabua *et al*., 2003; Marois *et al*., 2004; Silva *et al*., 2006; Tang *et al*., 2006). In Thailand, most of *S. suis* have been recovered from blood or CSF and are confirmed by PCR technique based on detection of 16S rRNA gene (Kerdsin *et al*., 2009). However, direct detection of *S. suis* from patient specimens

have not been reported in Thailand. Additionally, PCR technique based on specific capsule polysaccharide (*cps*) genes of each serotype has been developed to identify serotype of *S. suis* (Smith *et al*., 1999a; Tang *et al*., 2006).

Thus, our current interest focuses on direct detection of *S. suis* in hemoculture and identify serotype of *S. suis* by PCR technique. We expect that PCR technique will improve misclassified problem, speed up detection and identification of specific serotypes (2 or 1/2 and 1 or 14) of *S. suis*.