Studies also shown that the pathogen can be found in other animals such as wild boars, horses, dogs, and birds. However, difficulties in differentiating S. suis from other species of Streptococcus, in particular S. equi, S. zooepidemicus, and S. pyogenes, can lead to misidentification and underreporting of cases. The first reported case of meningitis caused by S. suis in human was at 1968 in Denmark. Today, most of the reported cases in humans originated from Southeast Asia. However, difficulties in differentiating S. suis from other species of Streptococcus, resulting in low cases report worldwide. Some studies have shown that the infection in human occurs sporadically. However, some literatures suggest that the bacteria has a tendency to infect during the driest month of the summer and the rainy season. The major risk factors in the outbreak were handling the carcass of a pig that died from unknown causes or slaughtering a sick pig. A high number of case is shown related to close contact with pigs or unprocessed pork meat. Pig farmers, abattoir workers, meat inspectors, people transporting pork, butchers, and veterinarians are people at risk. Some studies find that people in daily contact with pigs are usually infected through cut, abrasion, or infected wound.

In the UK, France, Germany, and the Netherlands, occupational exposure to pigs is highly related to S. suis infection. The Netherlands estimated approximately 1 per 100,000 is the annual risk of S. suis infection among abattoir workers and pig breeders. This rate is 1500-times higher than the general population.
higher than the risk among people who doesn't work at pork industry. The annual incidence in Hong Kong for the occupational group was 32 per 100,000, but only 350-times higher than the general population. The difference of the incidence between the countries may be because of more frequent S. suis infection in pigs in Asia. Risk different between occupational group and general population, caused by general population in Asia has higher contact rate with raw pork than those in the Netherlands.

The 2005 outbreak in Jiangxi Province, China, shows that people who ate well-cooked sick pigs did not develop clinical signs.

**CLINICAL FEATURES**

Cocci incubation period in human varies from a few hours to 2 days. Infection in humans is systemic and affects numerous organ systems. The most common clinical manifestation is purulent meningitis. The symptoms of meningitis include headache, fever, vomiting, and meningeal signs. Bacteraemia is often accompanies meningitis.

In human, S. suis infected patients become prone to acute renal failure, acute respiratory distress syndrome, and consumptive coagulopathy. A large proportion of people with acute S. suis infection had a toxic shock-like syndrome, which mortality rate was higher than the group that suffered from meningitis.

The other organ infections have also been reported; endocarditis, cellulitis, peritonitis, rhabdomyolysis, arthritis, spondylodiscitis, uveitis, and endophthalmitis, pneumonia. Skin findings such as petechiae, purpura, ecchymosis, hemorrhagic bullae and skin necrosis found in 6% to 31% of patients.

One noticeable feature of the infection is hearing loss with or without vestibular dysfunction following the meningitis. The hearing loss can be unilateral or bilateral. A study describe the deafness is in high frequency range and can be a complete deafness. The prognosis is ambiguous because some patients improve over time, and others do not.

**DIAGNOSIS AND THERAPY**

Unfortunately, a simple S. suis diagnostic kit has not been developed yet. The bacteria can be cultured from cerebrospinal fluid (CSF) or blood sample, but often misidentified. PCR is still the main diagnostic tool to diagnose S. suis infection.

The isolated S. suis from human cases are generally sensitive to penicillin. Hence, readily available drugs can be used to treat the infection. The use of corticosteroid is still debated whether it can reduce the development of hearing loss in patients or not.

**PREVENTION AND CONTROL**

S. suis vaccine for human and swine doesn’t exist. Moreover, there is no immunity present after the S. suis infection. However, other preventive measures can be taken.

Because some studies show a probability to contract the disease through skin lesion, meat industry practices should revise work practices to minimise such trauma. People whose occupation requires close contact with pigs should take general precaution, such as wearing protective gloves. Appropriate education about the disease for people who handle pork products or pigs is needed.

Raw pork products consumptions should be avoided. And, the practice of slaughtering diseased pigs for consumption should be ceased. Misidentification or under-diagnosed cases of S. suis infection happens because the lack of awareness among clinicians about the pathogen. Therefore, an increased awareness among the health workers is needed, especially when meningitis is diagnosed in people working with pork products or pigs.

**BIOSAFETY AND WORK SAFETY**

Implementation of the Occupational Health and Safety is one efforts to create a workplace that is safe, healthy, and free from environmental pollution, to reduce occupational accidents and disease, which in turn can improve the efficiency and productivity of labour. In the near future, people need more literature that discuss about personal protective equipment procedures and biosafety level. Biosafety level is a combination of practice and application of procedures by workers at the laboratory facilities and safety equipment usage when working with dangerous infectious pathogenic agents. Biosafety level term is also used to describe the safe method in handling and managing materials that can infect a laboratory.

**CONCLUSION**

S. suis diagnosis can only be made by referring the suspected patient to the nearest centre with PCR test and analysis. Raising the public awareness of the necessary precaution needed to be taken in animal and carcass handling is a necessity to prevent the infection.
Biosafety procedure must be implemented to health care centre, because it teaches us a discipline in handling and containment system against infectious microorganisms and hazardous biological materials. The principles of biosafety cover the basics of the containment system, including the practice, correct laboratory techniques, safety equipment, laboratory facilities to protect workers, environment, and the public from exposure to infectious microorganisms.

REFERENCES