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Safety Procedure for Biosafety and Controlling a Communicable Disease: *Streptococcus Suis*

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Background: *Streptococcus suis* infection is a zoonotic disease which cause fatal outbreak. Infection case is related to animal handling and dry season. Health workers on Timor island need to understand more about biosafety procedure and increase awareness of the disease as a potential causes of meningitis. **Objective:** To provide a simple yet comprehensive reading material for the health workers that is exposed to meningitis. **Method:** This is a descriptive explorative study, to search about *Streptococcus suis* in the James Cook University *OneSearch* library search engine and biosafety procedure in WHO and CDC database. The information in accessed articles were compiled into a review piece. **Conclusion:** The biggest risk factor for a *Streptococcus suis* outbreak is inappropriate pig carcass handling. The cocci infect via micro-lesion on the handler skin. Public awareness about an appropriate way to handle meat needed to be raised. Suspected case need to be referred to the nearest centre with an ability to conduct a PCR test. It is essential that people, especially health workers understand that the principles of biosafety cover the basics of the containment system, including the practice, and the correct laboratory techniques, safety equipment, laboratory facilities to protect workers, the environment, and the public from exposure to infectious microorganisms.

Keywords: Streptococcus suis, meningitis, pork handling

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BACKGROUND

Most people who live in Timor island, Indonesia, raise pigs in their backyard for economic and cultural reasons. It is also common to build the pen near or attached to the wall of the house. Moreover, a pig owner slaughters the pig for consumption on his own backyard, which lack of running water and absent of good sewage/drainage system.

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A house that is to close with the animal carcass, also poses a risk for zoonotic disease transmission. Indeed, *Streptococcus suis* transmission is not an exception. This article discusses *Streprococcus suis* infection, the vector of transmission, and the control measure that can be taken. This review was made to raise awareness of health workers who work in a similar setting in what occurred in Timor island.

EPIDEMIOLOGY

Streptococcus suis or *S.suis* is a Gram positive coccus.[1-3] It is a facultative anaerobic coccus. This facultative anaerobic coccus can cause a serious systemic infection in humans. It is reported

that the main reservoir of the pathogen is pigs.[1,4,5] In adult pigs, the bacteria are generally carried asymptomatically. But, it can cause severe infections in piglets.[2,6] Studies also shown that the pathogen can be found in other animals such as wild boars, horses, dogs, and birds.[4,5]

The first reported case of meningitis caused by *S. suis* in human was at 1968 in Denmark.[1,5] Today, most of the reported cases in humans originated from Southeast Asia.[1] However, difficulties in differentiating *S. suis* from other species of Streptococcus, resulting in low cases report worldwide.[9,11]

Some studies have shown that the infection in human occurs sporadically.[6] However, some literatures suggest that the bacteria has a tendency to infect during the driest month of the summer and the rainy season.[5,6]

The major risk factors in the outbreak were handling the carcass of a pig that died from unknown causes or slaughtering a sick pig.[7] A high number of case is shown related to close contact with pigs or unprocessed pork meat.[1,6,7,11,12,14] Pig farmers, abattoir workers, meat inspectors, people transporting pork, butchers, and veterinarians are people at risk.[6] Some studies find that people in daily contact with pigs are usually infected trough cut, abrasion, or infected wound.[4,7,11]

In the UK, France, Germany, and the Netherlands, occupational exposure to pigs is highly related to *S.suis* infection.[6] The Netherlands estimated approximately 1 per 100,000 is the annual risk of *S.suis* infection among abattoir workers and pig breeders.[1] This rate is 1500-times higher than the risk among people who doesn't work at pork industry.[6] The annual incidence in Hong Kong for the occupational group was 32 per 100,000, but only 350-times higher than the general population.[6] The difference of the incidence between the countries may be because of more frequent *S.suis* infection in pigs in Asia.[6] 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.[1]

CLINICAL FEATURES

Cocci incubation period in human varies from a few hours to 2 days.[7] Infection in humans is systemic and affects numerous organ systems. The most common clinical manifestation is purulent meningitis.[1,3,6,8-10] The symptoms of meningitis include headache, fever, vomiting, and meningeal signs.[1,11] Bacteraemia is often accompanies meningitis.[6]

In human, *S.suis* infected patients become prone to acute renal failure, acute respiratory distress syndrome, and consumptive coagulopathy.[1] 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.[12]

The other organ infections have also been reported; endocarditis, cellulitis, peritonitis, rhabdomyolysis, arthritis, spondylodiscitis, uveitis, and endophthalmitis, pneumonia.[1,6,8] Skin findings such as petechiae, purpura, ecchymosis, hemorrhagic bullae and skin necrosis found in 6% to 31% of patients.[1,2]

One noticeable feature of the infection is hearing loss with or without vestibular dysfunction following the meningitis.[1,6,11] The hearing loss can be unilateral or bilateral.[9] A study describe the deafness is in high frequency range and can be a complete deafness.[1,3] The prognosis is ambiguous because some patients improve over time, and others do not.[1]

DIAGNOSIS AND THERAPY

Unfortunately, a simple *S.suis* diagnostic kit has not been developed yet. [6,10] 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.[6]

The isolated *S.suis* from human cases are generally sensitive to penicillin.[7,13] 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.[5,6]

PREVENTION AND CONTROL

S.suis vaccine for human and swine doesn't exist.[6,7] Moreover, there is no immunity present after the *S.suis* infection. [6] 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.[6,15] People whose occupation requires close contact with pigs should take general precaution, such as wearing protective gloves.[15]

Appropriate education about the disease for people who handle pork products or pigs is needed.

Raw pork products consumptions should be avoided.[3,6,7] And, the practice of slaughtering diseased pigs for consumption should be ceased.[6]

Misidentification or under-diagnosed cases of *S.suis* infection happens because the lack of awareness among clinicians about the pathogen.[3,7] 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.[14,15]

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.

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