Epidemiological survey of classical swine fever in Tibetan pigs in Nyingchi, Tibet China

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ABSTRACT
Classical swine fever (CSF) is a major hazardous disease to the pigs and as a dangerous epidemic; it causes a serious economic losses to the pig industry. Though, a national compulsory immunization of CSF vaccines has been carried out for a long time, scarce information can be got about the immune effect of CSF in Tibetan pigs. The present study was to investigate the seroprevalence of CSF in Tibetan pigs in Nyingchi area of Tibet, China. A total 454 samples were collected from November 2014 to January 2015 and were investigated through enzyme-linked immuno sorbent assay (ELISA). The results showed that 241 (53.1%, 95% CI 48.4-57.8) pigs were found to be positive for CSF with the further distribution of 53.3% (95% CI 46.8-59.6), 49.5% (95% CI 42.2-56.8) and 93.8% (95% CI 69.8-99.8) in Tibetan counties of Nyingchi, Mainling and Gongbo’gyamda, respectively. There was no significant difference in male (52.8%, 95% CI 46.4-59.1) and female pigs (50.0%, 95% CI 42.6-57.4). Though, 53.1% of the serum samples were tested out positive to CSF, only the seroprevalence of CSF in Tibetan pigs in Gongbo’gyamda were higher than 70% which was ruled by the government. The low seroprevalence of CSF in Tibetan pigs should arise a serious concern and effective methods should be taken, in order to prevent CSF infection effectively.

Key words: Classical swine fever (CSF), Immune effect, Nyingchi area, Tibetan pig, Seroprevalence.

INTRODUCTION
Classical swine fever (CSF) is a serious and contagious viral disease of pigs and wild boar with a widespread worldwide distribution (Paton et al., 2003). Because of its high hazardous degree and wide distribution, the world organization for animal health has listed CSF as a category disease. CSF was first known in Tennessee, United States (USA) in 1810 (Agriculture, 2010). Within a few decades, it was reported by all over the world constantly and in 1925 for the first time in China (Tu et al., 2000). For many years, CSF had been the major swine disease in China (Shao et al., 2014). With the use of CSF vaccines, this situation have been controlled, but no regions can be declared free of CSF, and there is a long way to go to ultimately eradicate CSF in China (Luo et al., 2014).

Tibetan pig is relatively an ancient original indigenous breed, a rare plateau type pig in the world and is the only high altitude pasture pig breed in China. It is mainly distributed in the Yarlung zangbo river valley and eastern Tibet region. With high proteins and rich amino acids, the Tibetan pig meat is an important source of income for Tibetans nomads (Zhang et al., 2014). However, once infected with this virus, no effective controlling has been carried out to eradicate CSF (Edwards et al., 2000), except vaccination in advance, stamping out and controlled movement (Costard et al., 2013). In most parts of the world, CSF vaccines was inoculated to prevent CSF. In decades, China has carried out a compulsory vaccination policy, in which pig breeders were demanded to implement immunization for pigs with vaccines (Luo et al., 2014). However, as the herdsmen were lacking of knowledge and prevention awareness on this disease, previous study found that the immune antibody is low in some region, or even only 20% of the qualified rate (Yao et al., 2011). Therefore, the present study, for the first time has reported the seroprevalence of CSF in Tibetan pigs in Nyingchi region of Tibet with lower immune effects of CSF vaccines on pigs which should have an emphasis for the public concern.

MATERIALS AND METHODS
A total 454 blood samples were collected in slaughterhouse from three counties (Nyingchi, Mainling and Gongbo’gyamda) in Tibet, China (Fig. 1) from November, 2014 to January, 2015. After collection, each sample was centrifuged at 3000×g for 20 min and the serum was separated and stored at -20°C, until subsequent use and further analysis.

The serum samples were detected the seroprevalence of CSF by a commercial ELISA kit (Shanghai Huifying biological technology co., LTD, 201503) according to the manufacturer’s instructions.

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Fig 1: The map of geographical distribution of CSF serological investigation in Tibet Nyingchi area.

The results were based on the critical value (cut off) according to the formula: Critical Value = the average of Negative control well + 0.15. The validity was ensured as: the average of Positive control well ≥1.00; the average of Negative control well ≤0.10. The samples were interpreted as negative control and positive control if sample OD < Calculated Critical (CUT OFF) and OD ≥ Calculate Critical (CUT OFF), respectively.

Differences seroprevalence of Tibetan CSF from different geographical locations and gender groups were analyzed with a chi-squared test using SPSS (release 18.0 standard version, Statistical Analysis System). The value of \( P < 0.05 \) was considered as statistically significant.

RESULTS AND DISCUSSION

The seroprevalence of CSF in Tibet swine was 53.1\% (95\% CI 48.4-57.8), with the seroprevalence of 53.3\% (95\% CI 46.8-59.6), 49.5\% (95\% CI 42.2-56.8) and 93.8\% (95\% CI 69.8-99.8) in Nyingchi, Mainling and Gongbo’gyamda, respectively (Table 1).

The seroprevalence of CSF was 52.8\% (95\% CI 46.4-59.1), 50.0\% (95\% CI 42.6-57.4) and 93.8\% (95\% CI 69.8-99.8), respectively in different gender pigs (male pigs, female and uncertain) (Table 2). And there was no significant difference of seroprevalence of CSF in different genders (P ≥0.05).

Table 1: Seroprevalence of CSF in Tibet swine in different counties in Tibet Nyingchi area, China.

<table>
<thead>
<tr>
<th>Area</th>
<th>Samples</th>
<th>Positive serum</th>
<th>Seroprevalence % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nyingchi</td>
<td>246</td>
<td>131</td>
<td>53.3 (46.8-59.6)</td>
</tr>
<tr>
<td>Mainling</td>
<td>192</td>
<td>95</td>
<td>49.5(42.2-56.8)</td>
</tr>
<tr>
<td>Gongbo’gyamda</td>
<td>16</td>
<td>15</td>
<td>93.8(69.8-99.8)</td>
</tr>
<tr>
<td>Total</td>
<td>454</td>
<td>241</td>
<td>53.1(48.4-57.8)</td>
</tr>
</tbody>
</table>

Table 2: Seroprevalence of CSF in Tibet swine in different genders in Tibet Nyingchi area ,China.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Samples</th>
<th>Positive serum</th>
<th>Seroprevalence % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>250</td>
<td>132</td>
<td>52.8(46.4-59.1)</td>
</tr>
<tr>
<td>Female</td>
<td>188</td>
<td>94</td>
<td>50.0(42.6-57.4)</td>
</tr>
<tr>
<td>Unknown</td>
<td>16</td>
<td>15</td>
<td>93.8(69.8-99.8)</td>
</tr>
</tbody>
</table>

CSF was first discovered in the 19th century in the United States (Edwards et al., 2000). And many countries had successfully eradicated this disease like United States of America (USA), Australia, New Zealand and Canada; however, CSF had become a major infectious disease which arose a big potential threat to the pig industry and caused serious economic losses in China.

The seroprevalence of CSF in domestic pigs has been reported in most parts of China. Previously, a high seroprevalence of CSF (81\%) in pigs was reported in Gansu province (Wang, 2012); and the seroprevalence of CSF in pigs were also found at high rates (96.23\% and 93.6\%) in Qinghai and Hubei, respectively (Wang et al., 2003; Kong et al., 2011). It is suggested that in most regions of China have good immune effects of CSF. In the present study, the seroprevalence of CSF in Tibetan pigs were 53.1\% (95\% CI 48.4-57.8) which was lower than that in Gansu, Qinghai and Hubei. Also, it was far less than the prevalence standards (≥70\%) which was legislated by the ministry of agriculture of China. The high seroprevalence of CSF in pigs in Gongbo’gyamda may not means the well immune status of CSF vaccines in this area as the samples limited (n=16). Also, it is very often finding the CSF cases in clinical diagnosis in Tibet. The reasons may because of possessing a latent infection of CSF without any obvious clinical
symptoms which might not catch the breeder’s attention. And wrong immunization approach; inadequate immunization dose; unreasonable vaccine dilutions; uneven dilutions the interference of maternal antibody; poor quality vaccines; the omission of the immune and “inherent” shortcomings of C-strain-based vaccines (Luo et al., 2014) may also contribute the lower immune effect.

The seroprevalence was observed 52.8% (95% CI 46.4-59.1) and 50.0% (95% CI 42.6-57.4) in male and female pigs, respectively; differences between genders were also found statistically non-significant (P≥0.05) which might suggest that susceptibility to CSF infection is not related to sex of Tibetan pigs.

We have reported the low seroprevalence of CSF in Tibetan pigs for the first time; it means through the method of immunization did not achieve the goal of preventing and controlling CSF. Therefore, we suggest the local government should make all stakeholders (e.g. farmers, scientists, veterinarians, vaccine producers, officials and the community) unite to fight against CSF (Luo et al., 2014).

CONCLUSION

The seroprevalence of CSF in Tibetan pig was investigated for the first time and the immune effect did not meet the 70% of standards promulgated by the ministry of agriculture. Therefore, more attention should be given to the low seroprevalence of CSF in Tibetan pigs and more effect measures should carried out to prevent it.

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CONFLICT OF INTEREST

None of the authors have any conflict of interest.

REFERENCES


