



Seroprevalence and associated risk factors of important pig viral diseases in Bhutan



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ARTICLE INFO

Article history:

Received 8 April 2014

Received in revised form 4 July 2014

Accepted 5 July 2014

Keywords:

Bhutan

Seroprevalence

Pig viral diseases

Classical swine fever virus

Swine influenza virus

Porcine circovirus

Porcine reproductive and respiratory syndrome virus

Aujeszky's disease virus

Virus neutralization test

Haemagglutination test

ELISA

ABSTRACT

A cross-sectional serological study was conducted in Bhutan between October 2011 and February 2012 to determine the prevalence of antibodies to classical swine fever virus (CSFV), porcine reproductive and respiratory syndrome virus (PRRSV), porcine circovirus type 2 (PCV2), swine influenza virus (SIV) subtype H1N1 and Aujeszky's disease virus (ADV). Furthermore, risk factors for the seropositive status were investigated.

Antibodies to SIV, subtype H1N1 (likely pandemic H1N1 2009) were detected in 49% of the pigs in the government farms, and 8% of the village backyard pigs. For PCV2, these percentages were 73% and 37% respectively. For CSFV, the percentages were closer together, with 62% and 52% respectively. It should be taken into consideration that vaccination of piglets is routine in the government herds, and that piglets distributed to backyard farms are also vaccinated. No direct evidence of CSFV infections was found, either by clinical signs or virus isolation. Antibodies to PRRSV and Aujeszky's disease, on the other hand, were not found at all.

Risk factors found are mainly related to practices of swill feeding and other biosecurity measures. For CSFV, these were swill feeding (OR = 2.25, 95% CI: 1.01–4.99) and contact with neighbour's pigs (OR = 0.31, 95% CI: 0.13–0.75). For PCV2 this was lending of boars for local breeding purposes (OR = 3.30, 95% CI: 1.43–7.59).

The results of this study showed that PCV2 and SIV infections are important in pigs in Bhutan and thus appropriate control strategies need to be designed and applied which could involve strict regulation on the import of live pigs and vaccination against these diseases.

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1. Introduction

Village backyard pig farming plays an integral role in providing nutrients and household income in many low-income countries (Deka et al., 2007). In Bhutan, located

between China and India, village backyard pig farming is characterized by small numbers of pigs reared by subsistence farmers (Timsina and Sherpa, 2005). In addition, there are three government-owned pig-breeding farms in Bhutan to supply hybridized piglets to the farmers for fattening and cross-breeding purposes. These government breeding farms have been set up to improve local breeds through cross breeding with exotic breeds, which are being imported from various countries, including India, Australia, Denmark and, most recently, from the UK. The number of

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cross-bred pigs in the country has increased over the past years, constituting about 38% of the total pig population (Nidup et al., 2011). Semi-commercial back-yard farms are being established and a decline in the numbers of indigenous pigs is seen. There is a high risk of introduction of exotic diseases in the country through the import of exotic pigs and further spreading to the village backyard farms through subsequent distribution of pigs by central government breeding farms. This has important socio-economic and possibly public health consequences, constituting a threat to livelihood of the rural livestock farmers.

There has been no scientific study on pig diseases in Bhutan except for a surveillance study of CSFV, demonstrating a seroprevalence of 6% (Raika, 1999). More recently, porcine reproductive and respiratory syndrome (PRRS) cases have been confirmed for the first time in government pig breeding farms (Raika et al., 2008). Since then PRRS is under control due to an effective control program consisting of regular monitoring, serological testing of breeding sows and culling of seropositive animals. Similarly, there is a need to have information on other important pig viruses that are of economic importance, like swine influenza virus (SIV), Aujeszky's disease virus (ADV) and infections caused by porcine circovirus type 2 (PCV2). Bhutan is at risk for introducing pig viruses; it shares a border with India in the south, across which there are imports of fresh pig meat and sometimes illegal live pig imports. In addition, Bhutan imports live pigs for breeding purposes to improve local production, importation of these pigs contributes to the risk of introducing exotic pig pathogens. Subsequent spread of these pathogens may be enhanced by poor biosecurity measures at the village backyard level.

The aims of this study were to determine the prevalence of antibodies to CSFV, PRRSV, ADV, SIV and PCV2 in government breeding farms and village backyard farms in Bhutan, and to identify possible risk factors associated with seropositivity of these viruses.

2. Materials and methods

2.1. Study area and study population

Bhutan is subdivided into 20 districts. In each district a District Veterinary Hospital (DVH) is present, headed by a District Livestock Officer (DLO) responsible for overall coordination of animal health and livestock production in their respective district and all related administrative duties. There is a concentration of pigs towards the southern regions, due to climate, landscape and religious factors (Nidup et al., 2011).

The three government breeding farms are located in the districts of Thimphu (west region), Sarpang (east-central region), and Mongar (east region) (Fig. 1). These breeding farms have been established with the main objectives of improving local pigs through cross-breeding programs and distribution of piglets to farmers in the country. The size of these government farms currently ranges from 65 to 150 sows, with accompanying piglets and some replacement stock (Table 1). The farm in Sarpang is the central breeding farm, providing replacement stock to both other government farms.

Village backyard farms are those farms where small numbers of pigs are kept by subsistence farmers for their household consumption and some may be sold to increase household income. Generally, a farmer will have just 1–5 pigs. With the initiation of cross-breeding programs by the government, many pigs in the village backyard farms nowadays are cross-breeds supplied by the government breeding farms. The remaining pigs are local indigenous pigs.

There is no central registration of pig farms in Bhutan, and data on numbers of farms and pigs depend on infrequent livestock censuses. According to livestock statistics (Anon., 2008), there were a total of 27,500 pigs in Bhutan in 2008. However, these figures are likely to be an underestimation because the survey depended on farmers actively reporting these numbers to the District Livestock Centres (LECs).

The only vaccine that is currently licensed for use in pigs in Bhutan is a locally produced, lapinized, live-attenuated CSF vaccine. The vaccine is for intra-muscular application only, and therefore its administration requires a veterinarian. As a result, vaccination against CSF is mostly restricted to Government pig breeding farms and few semi-commercial backyard farms. At village backyard level, the use of this vaccine is very limited.

2.2. Sampling strategy

A cross-sectional study was carried out in three government pig breeding pig farms and 343 village backyard pig farms in Bhutan to determine the seroprevalence of five pig diseases. Blood samples for this serological study were collected between October 2011 and February 2012. This study was conducted following approval by the Council for Renewable Natural Resources Research of Bhutan (CORRB), an organization within the Ministry of Agriculture and Forests (MOAF), mandated to coordinate research policy and programs in the country.

2.2.1. Government breeding pig farms

In all three government pig breeding farms, a total of 101 sows, 74 gilts (replacement stock), and 201 piglets (<90 days) were included. The numbers of pigs to be sampled in each subcategory were chosen according to an expected seroprevalence of 50%, with a desired precision of 15% and a confidence level of 95% (Thrusfield, 1995). Due to local circumstances on the individual farms, the ultimate number of samples was occasionally somewhat higher or lower (Table 1). Sows and gilts were sampled randomly from the pigs present. Piglets, however, were mainly sampled among those aged approximately 45–50 days. This was because they are sold to village backyard farms shortly after they are weaned (45–50 days) and are not available beyond that age. Some older piglets (up to 90 days of age, mainly kept as replacement stocks) were also included if present. A total of 376 pigs were sampled on the three government breeding farms.

2.2.2. Village backyard pig farms

A multi-stage sampling approach was used for the village backyard farms from the 20 districts. Due to the lack of

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