



Sero-prevalence of the neglected zoonoses of porcine brucellosis in the North Eastern Hill State of Meghalaya, India

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ABSTRACT

Pig husbandry is an important farming activity of hill state of Meghalaya. Rice and meat is the staple diet for the tribal people of the state with pork being the most preferred one. Even the states' own production cannot fulfill the high demand of pork and hence pigs are being brought from other Indian states. The pig industry in the state is challenged by many endemic and emerging diseases. The threat of zoonotic diseases in this tribal in-habitat state is also high because of closer contact of animals and human. The usual endemic diseases of swine in the state are Classical swine fever, Swine foot and mouth disease, Porcine reproductive and respiratory syndrome, Porcine circo virus, Salmonellosis, Scabies etc. There are also reports of few zoonotic pathogens from the state viz., Swine erysipelas, Brucellosis, Scabies, Salmonellosis, Listeriosis, Japanese encephalitis, Bird flu etc. The trans-boundary important African swine fever had just entered in its neighbouring states of Assam and Arunachal Pradesh. The state of Meghalaya is doing ground preparation to tackle any eventuality. To sustain the pig husbandry and protect its people from zoonotic diseases; all the important endemic, emerging and zoonotic diseases surveillance is needed. Taking account of the importance of pig husbandry in the region, we have tried to formulate a systematic sero-survey study for a neglected disease-porcine brucellosis in the state of Meghalaya. Altogether, 515 random porcine serum samples were collected from 27 epidemiological units stretching across Meghalaya during the period of 2018-19 and were screened with reputed commercial indirect ELISA kits for porcine brucellosis. A sero-prevalence of 1.17% was recorded for porcine brucellosis in Meghalaya. This representative sero-survey gave a picture for the presence of the pathogen in pigs and there is need to look forward for not only the cases of brucellosis in pigs but also in human especially those associated with pig rearing, slaughter etc.

1. Introduction

Zoonoses classical definition states about those infections which are naturally transmissible between human being

and vertebrate animals. Around 2/3rd of pathogens associated with human infectious disease have originated or are shared with wild or domestic animals (Karesh *et al.*, 2012). In India, the top priority zoonotic diseases are

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Rabies, Tuberculosis, Brucellosis, Leptopirosis, Pandemic flu, Food borne zoonoses, Vector borne zoonoses, etc (Sekar *et al.*, 2011). The information related to these prioritized zoonoses are also limited and the country is struggling to control these infections because of many issues viz., huge population, lack of diagnostics, vaccine, affordable treatment, concrete policies and economics involved (Kumar *et al.*, 2015). The reported or documented zoonotic diseases from the state of Meghalaya are Brucellosis, Bovine tuberculosis, Bird flu, Listeriosis, Leptospirosis, Campylobacteriosis, Scabies, Erysipelas, Salmonellosis, Japanese encephalitis, Rabies, Scrub Typhus, Anthrax etc (Das *et al.*, 2010; Das *et al.*, 2014; Shakuntala *et al.*, 2019, 2020; Milton *et al.*, 2019; Srinivasan *et al.*, 2018). Brucellosis is one of the most important endemic diseases in the world, in the country and in Meghalaya also.

Government of India had given an special package of Rs. 3,289 crore for the animal husbandry & dairy sector which is 12% higher than allocation for the current fiscal with special emphasis to control of Foot and mouth disease (FMD) and Brucellosis in livestock in the country by 2024 (Parida and Misra, 2020). Brucellosis is an important livestock disease affecting primarily bovine and caprine throughout the globe. It is also an important zoonotic disease recognized since 1850s where it affected soldiers of Malta who consumed infected raw goat milk. It causes a loss of an estimated of US \$ 3400 million in India (Singh *et al.*, 2015). Brucellosis is caused by a gram negative cocco-bacilli of genus *Brucella* having 12 species namely *Brucella abortus*, *B. canis*, *B. ceti*, *B. inopinata*, *B. melitensis*, *B. microti*, *B. neotomae*, *B. ovis*, *B. papionis*, *B. pinnipedialis*, *B. suis* and *B. vulpis* as per standing List of Prokaryotic names with Standing in Nomenclature in Bacterio.net (Parte , 2018; Euzéby, 1997). Out of these mentioned 12 species, only four are of major zoonotic importance viz., *B. melitensis*, *B. abortus*, *B. suis* and *B. canis*. The present study focuses on the prevalence of porcine brucellosis in the state of Meghalaya. Porcine brucellosis is caused by *B. suis* which is manifested in animals as reproductive disorders and joint illness. The swine herd infected with brucellosis is usually noticed with late gestation abortion, birth of dead or weak piglets. The adult pigs usually carry the infection and herd may show infertility problems. The prominent sign in boars is orchitis. The organism is shed in the environment through aborted material, urine, discharges from

reproductive organs like semen, vaginal fluid and through these shedding can infect the other animals following ingestion of contaminated feed, direct contact with infected material, sexual mode etc. It is zoonotic in nature and can infect human (pig handlers, abattoir workers) through direct contact (Shakuntala *et al.*, 2020). The positive pigs for porcine brucellosis should be culled in order to contain the disease. Brucellosis is a herd disease and once it is established in the herd than it is quite difficult to contain the disease. In general, animals are not given any specific treatment for brucellosis. In human, a course of streptomycin and doxycycline is the treatment choice. Brucellosis infection enters in the farm because of breakdown of biosecurity measures and when new animals are given entry in the farm without proper quarantine (Shome *et al.*, 2016). The vaccination of porcine brucellosis is usually not practiced in the country. Porcine brucellosis is also been documented in the state with a sero-prevalence of 2% (72/3597) by ELISA and 0.36% (13/3597) by RBPT for the year 2012-17 (Shakuntala *et al.*, 2020).

2. Methodology

We have collected 515 random porcine sera from 27 epidemiological units covering all the three major hill region of the state (Khasi, Garo and Jaintia hills) and the sample size was calculated using Epi calculator developed by ICAR- National Institute of Veterinary Epidemiology and Disease Informatics. A two stage stratified random sampling methodology was applied for sample calculation with specified design and cluster prevalence accounting for variation in sensitivity and specificity of test used for diagnosis at 95% confidence interval. The samples were collected with information of age, sex, geographical location upto individual house level for one year period of 2018-19 for the state of Meghalaya. The age distributions of the sample are from 3 months to 2 years for the pig age. 248 (48.15%) samples were of female and rest 267 (51.85%) were from male. The sera samples were collected aseptically by veterinarian following ethical guidelines and were transported to laboratory in refrigerated condition and were kept at -80°C in the laboratory until further testing. The sera samples were tested for porcine brucellosis with indirect ELISA kit for diagnosis of porcine brucellosis procured from InGenasa, Spain. The kit is directed to detect IgG antibodies specific to LPS of smooth *Brucella suis* through indirect ELISA.

3. Results and discussion

1.17% (6/515) sero-prevalence was noted for porcine brucellosis in the swine population of the state. The samples were positive from four different farms and out of the 6 samples coming positive, 5 were from a single village (Table 1). The positive samples were from 3 month of age to 8 month of age with 4 being male and 2 being female. The prevalence rate is low and is mostly coming from the same geographical location. An earlier study in Meghalaya also showed a sero-prevalence of 2% for porcine brucellosis using ELISA (Shakuntala *et al.*, 2020). Both of the study clearly established that the disease is well present in the pig population of the state. Pig husbandry is an important activity in North East India including Meghalaya but there is a lack of scientific study in this regard for porcine brucellosis. Brucellosis in cattle is also prevalent in the region and a prevalence of 4.69% is recorded in the state of Meghalaya (Shome *et al.*, 2019). These data invites the urgency for the study of human brucellosis in the state. Most often the pig abortion cases goes to the suspicion of Classical swine fever, and Porcine respiratory and reproductive syndrome in the region and other etiological agents responsible for porcine infectious abortion like Japanese encephalitis, Salmonellosis are also not so well established in the state (Mukherjee *et al.*, 2018). We have earlier documented isolation of *B.suis* from abortion discharge from the state (Shakuntala *et al.*, 2020). Unless and until the surveillance of these diseases and the cause of abortion are not investigated, it is difficult to tell the disease burden. Government of India had launched a free brucella vaccination

campaign in cattle in 2019 for whole country. The prevalence of porcine brucellosis is low and it is the good time to check this pathogen in this stage in the pig population which would save not only the precious animal of the region but also safeguard human health. There is no commercial vaccine for porcine brucellosis which is a challenge; hence, test and slaughter policy could be advocated for pigs in the country. It would be better to check the spread of brucellosis in pig population at present to safeguard pig and human health. There is a need to do sero-prevalance study in human population also with special emphasis on animal handlers and cases with infertility. Our earlier large population study involving 3,597 pig sera also showed the presence of porcine brucellosis in the state. Further, again this one year sero-survey strengthens the earlier findings and now the state should take action for control and prevention for this zoonotic disease in the state for not only in bovines but also in pigs.

4. Conclusion

Porcine brucellosis is a global issue in the pig rearing countries including India. In North East India, the pigs are the preferred animals for raising as meat animals. The present sero-prevalence study in the state showed the presence of this disease but with low prevalence. Porcine brucellosis is still not widespread in the state and if in this stage the disease is checked through test and slaughter policy than the disease can be well controlled. This approach will not only safeguard pig sector but also human health in the state.

Table 1- result of porcine sera for brucellosis

Code	Age (months)	Sex	Farm	Village	block	District
P-11	6	Female	Farm 1/Kharkongor	Umphyrnai	Mawryngkneng	East Khasi Hills
P-15	5	Male	Farm2/ Wankhar	Umphyrnai	Mawryngkneng	East Khasi Hills
P-16	5	Male	Farm2/ Wankhar	Umphyrnai	Mawryngkneng	East Khasi Hills
P-17	5	Male	Farm2/ Wankhar	Umphyrnai	Mawryngkneng	East Khasi Hills
P-21	3	Male	Farm3/ khyriem	Umphyrnai	Mawryngkneng	East Khasi Hills
4-NK	8	Female	Farm4/ Mynsong	Nongkrah	Thadlaskein	West Jaintia Hills

Conflict of Interest: The authors declare no conflict of interest

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