

Research Article

SERO-PREVALENCE OF THE NEGLECTED ZONOOSES OF PORCINE ERYSIPELAS IN THE NORTH EASTERN HILL STATE OF MEGHALAYA, INDIA

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ABSTRACT: *Erysipelothrix rhusiopathiae* is a zoonotic bacterial pathogen of porcine origin. It can cause systemic bacterial infection leading to erysipelas on skin, arthritis, endocarditis in both pigs and human beings. The state of Meghalaya had recorded few zoonotic diseases viz., Brucellosis, Scrub typhus, Japanese encephalitis, Bird flu, Salmonellosis, Listeriosis, Colibacillosis, Swine erysipelas etc. The state had earlier reported laboratory confirmed outbreak of *E. rhusiopathiae* in the year 2012, which was followed by a pilot scale sero-prevalence study in pigs in two representative districts of Meghalaya. However, during 2018-19 a systematic sero-survey was carried out for this important zoonotic disease in swine population of Meghalaya. In the present study, a total of 515 random serum samples were collected across Meghalaya which were screened for porcine *E. rhusiopathiae* with reputed commercial indirect ELISA kits and the screening result showed a sero-prevalence of 0.97%. The presence of this zoonotic pathogen warrants attention from not only the veterinary department in term of disease reporting, prevention and control but also from the medical fraternity to report human cases from the state.

Key words: Meghalaya, *Erysipelothrix rhusiopathiae*, Erysipelas, Sero-prevalence, Zoonotic disease.

INTRODUCTION

The pathogen which can infect animal can also infect or adapt to human body either establishing in a parasitic or symbiotic relationship for its survivability. Here comes the importance of zoonotic diseases and its related studies in both animal and humans. Zoonoses are diseases and infections those are naturally transmissible between vertebrate animals and humans e.g., rabies. Around 58% (817/1400) of the known human pathogen are zoonotic and 73% (130/177) of emerging or re-emerging pathogens are also zoonotic in nature (Woolhouse and Gowtage-Sequeria 2005). *Erysipelothrix rhusiopathiae* is also one among these zoonotic diseases seen globally especially in the pig grower countries affecting both pigs and human beings. *E. rhusiopathiae* bacteria are small sized, pleomorphic, gram positive, non-sporulating, microaerophilic bacilli which could be pathogenic,

commensal or saprophytic in nature. In 1876, Koch was the first to isolate a strain of the genus *Erysipelothrix* - *E. muriseptica* from a mouse. Later, in 1882, Loeffler isolated *Erysipelothrix* from swine and then in 1884 Rosenbach isolated it from the skin lesions of human (Brooke and Riley 1999). At present, there are 05 genome assemblies (04 complete and 01 draft) available in National Centre for Biotechnological Information (NCBI) database for *E. rhusiopathiae*. The whole genome of *E. rhusiopathiae* str. Fugisawa (Assembly-GCA_000270085.1) is around 1.79 Mb with GC content of 36.60%. Infections from *E. rhusiopathiae* comes under bacterial zoonoses with swine as the principal host and occasionally causing skin infections in human beings. In swine, the disease can be seen in three forms: acute septicemic form which is usually fatal; sub-acute form shows skin lesions (popularly known as Diamond skin

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disease) and in chronic form mainly cause local arthritis, endocarditis. The Infection is disseminated rapidly from infected pig to other healthy in closed herd. Clinically, usually within 24 hours, the infected pigs develops septicemia and leads to fatal disseminated intravascular coagulation. The infection enters in the farm because of breakdown of biosecurity measures and when new animals are given entry in the farm without proper quarantine (Das *et al.* 2014). Though *E. rhusiopathiae* vaccine is available in other parts of the world but is not available in India.

Similarly, in human, the major findings are skin erysipeloid, septicaemia, endocarditis and/or arthritis. The risk groups of people associated with the infection in human are butchers, slaughterhouse workers, veterinarians, farmers and fish handlers. The portal route of entry is through skin injury and till date there have been no reports of person-to-person transmission (Brooke and Riley 1999). From India, few reports of human *E. rhusiopathiae* infections are recorded in endocarditis patients (Thomas *et al.* 1996, Basu and Tewari 2013), arthritis (Mukhopadhyay *et al.* 2012) and other systemic infections (Singh *et al.* 2002, Naveen *et al.* 2012). Penicillin G is the drug of choice for infections caused by *E. rhusiopathiae*. It is to be noted that *E. rhusiopathiae* is resistant to Vancomycin and empirically the drug Vancomycin is often used for the treatment of bacterial endocarditis (Romney *et al.* 2001) which shouldn't be practiced for *E. rhusiopathiae* infections. The Present study is focused on this neglected zoonotic disease caused by *E. rhusiopathiae* from the state of Meghalaya with an aim to carry out a systematic sero-prevalence study in pigs. The other zoonotic diseases recorded in the state of Meghalaya are Brucellosis, Bovine tuberculosis, Listeriosis, Campylobacteriosis, Scabies, Salmonellosis, Japanese encephalitis, Rabies, Scrub typhus, Anthrax etc. Some of these diseases were reported through systematic survey and other as sporadic cases or outbreak reported by various department or agencies. Pig husbandry is one of the major and promising farming activities in the state. Pork and its delicacies are one of the favourite among the tribal population of the state and other minor non-tribal population residing here are also well adapted to the state culinary practices. Various pork based food items are dohsniang, jadoh with pork etc (Kadirvel *et al.* 2018). The native pig of Meghalaya is NiangMegha and other crossbred mainly consists of Hampshire breed. The Classical Swine fever (CSF), Porcine circo virus-2, Scabies are widely prevalent in the state and a low prevalence is seen for Porcine respiratory and reproductive syndrome (PRRS), Swine foot and mouth

disease, Brucellosis, Listeriosis (Das *et al.* 2010, Mukherjee *et al.* 2019). Meghalaya is basically a hilly state with three major hills Khasi, Garo and Jaintia hills. The major market in the state is Shillong for Khasi hills, which is the capital of the state. The Khasi hills through its Ri-Bhoi district touches the border of Guwahati, Assam being another prominent commercial hub in the whole North Eastern Hill region. Tura is the main commercial area of Garo hills and Jowai for Jaintia hills. The state has a wide variety of diversity and has two of the world wettest place on Earth viz., Cherrapunjee and Mawsynram. The state is unique in the sense that it is the only matriarchal society in the whole country with female being the head of family pertaining ownership of property. They are forerunners who take major responsibility in house and even in agricultural and animal husbandry field. The state human population in indigenous and described as tribal population by Government of India with special status to preserve its culture and people. Our laboratory is one of the pioneer laboratories in the NE states and in the state of Meghalaya which focuses on the research of zoonotic diseases besides the endemic and trans-boundary important diseases of livestock of the region since last 4 decades. We have earlier also recorded the first outbreak of erysipelas in the state and did a pilot sero-prevalence study in two selected Districts- Ri-Bhoi and East Khasi hill of Meghalaya, in the year 2012-15, which turn out to be 5.12% (21/410) (Das *et al.* 2015).

MATERIALS AND METHODS

A total of 515 random porcine sera were collected from the whole state of Meghalaya for one year period of 2018-19 for screening of swine erysipelas. The sample size was calculated through two stage stratified random sampling methodology with specified design and cluster prevalence accounting for variation in sensitivity and specificity of test used for diagnosis at 95% confidence interval, using Epi calculator developed by ICAR-NIVEDI, Bangalore. The state of Meghalaya has an area of 22,429 Sq. Km. with 29.67 lakh human population (census 2011) and 5.69 lakh pig population (census 2012). Altogether, these 516 porcine sera were collected from 27 epidemiological units covering whole geographical locations of the state with information of sex, age, geographical location upto village and individual house level. The samples were collected jointly by veterinarian from our institute alongwith veterinarian of Department of Veterinary and Animal Husbandry, Government of Meghalaya following ethical guidelines. The blood collected in serum vacutainers were then transported in refrigerated condition to laboratory where it was further

processed for serum collection and kept in -20°C till further work. The state has been divided into 11 districts but most of the census is available for 07 districts as other were quite new districts. We have collected samples from all the representative hills of Meghalaya covering almost all the corners except the extreme terrain area from which sampling was difficult. The swine erysipelas sero-testing was carried out with indirect ELISA MalRojo procured from InGenesa.

RESULTS AND DISCUSSION

A sero-prevalence of 0.97% (05/515) was seen for *E.rhusiopathiae* in Meghalaya for the sampling done in the year 2018-19. The samples were positive from Betasing block, South West Garo hills district (03 number), Thadlaskein, West Jaintia Hills (01) and Jirang, Ri- Bhoi (01). The positive animals were of 4 month to 1 year of age group with 3 males and 2 females being positive. The disease is seen over almost all the three major hills of Meghalaya. The prevalence rate is low; hence the major outbreak was not noticed and not so well reported. But with our earlier and present study, it is well established that the disease is present in the pig population of the state and the same picture would also come true for other North Eastern states of India with some change in rates, only if surveyed, as they also have somewhat similar type of culture, pig husbandry practices and open borders. The presence of other prominent swine diseases in the state like CSF, Swine FMD, is same in all these NE states. The studies on *E. rhusiopathiae* are not so well documented in the pig population of the region and hence human record for these diseases in the swine handlers or high risk group are also not being reported. The vaccination for *E. rhusiopathiae* is also not practiced in India and it is not available to date in the country. As *E. rhusiopathiae* is documented from pig population and human patients from the country (Thomas *et al.* 1996, Mukhopadhyay *et al.* 2012, Naveen *et al.* 2012), so it would be better to vaccinate the pig population protecting both swine and human population. There is also a need to conduct sero-prevalance study in human population also with special emphasis on endocarditis patients. The country needs to put an effort on research for the development of vaccine against *E. rhusiopathiae* vaccine in swine population. There has been reports *E. rhusiopathiae* infection from all major pig rearing countries alongwith isolated outbreak reports from India (Char *et al.* 1993, Saini *et al.* 1994, Sankar *et al.* 2019,). The disease has been reported from North Eastern states of India viz., Meghalaya (Das *et al.* 2014) and Nagaland state (Barman *et al.* 2016). With the symptoms of fever

and haemorrhage, endemic CSF and emerging PRRS were the most common suspect in such outbreaks. In an earlier reported outbreak investigation by our laboratory we could detect *E. rhusiopathiae* infection only after ruling out these two diseases i.e, PRRS and CSF. Later with targeted treatment for *E. rhusiopathiae* infections we could control the outbreak. In that outbreak, the pigs were brought from an open market located in the border of Meghalaya-Assam called Byrnihat. The high demand of pork and its product invites the import of pigs from other North Eastern states most of which comes from other parts of the country following rail, road transport travelling long distances and reaching the markets in Guwahati metropolitan, Assam or Dimapur city, Nagaland, from where it reaches the market of Byrnihat and then finally to Meghalaya. The international route is not so well documented but the porous border in the state of Mizoram, the Moreh town of Manipur and other unestablished borders in NE hills bring the pigs from neighbour Burma (Myanmar) to Dimapur market and then it follows to Meghalaya via Byrnihat. The animals which are coming from rest of India are either raised in farms or are scavengers and they can bring many diseases to the state where pig farming is still mostly to backyard farming with 3-4 average animals in each household. Most of the rural tribal people raise pigs at their backyard and give stall feeding. Even though the access of veterinary services would be less here because of hilly tough terrain; still they are better raised than the other part of India as scavenging system of pig is not practiced in the state.

Our earlier pilot sero-screening survey for two representative districts of Meghalaya viz. East Khasi Hills and Ri-Bhoi showed 5.12% prevalence rate indicating the presence of the pathogen in the region. This earlier study was done on the retrospective repository sera and mostly was of large farm origin, hence, showed a higher prevalence in these districts. The present one year sero-survey study strengthens the earlier findings thus alerting the state in taking action for the control and presentation of this zoonotic disease. Through one questioner survey carried out on 30 veterinarians of Meghalaya about zoonotic diseases, a lone veterinarian from Jaintia Hills reported an encounter with *E.rhusiopathiae* isolated case. Hence, through all these series of work we can conclude that *E.rhusiopathiae* infections are present in the pig population of Meghalaya and infections are coming forward as sporadic cases or single outbreak. The Veterinarian in the state should keep a vigil on this disease in both pig and human population.

In India, the top priority zoonotic diseases are Rabies, Tuberculosis, Brucellosis, Leptospirosis, Pandemic flu, Food borne zoonoses, Vector borne zoonoses, etc (Sekar *et al.* 2011). There is less information in term of these zoonotic diseases and the country is still struggling to control the established zoonoses because of many issues viz., huge human and animal population, lack of diagnostics, vaccine, affordable treatment, concrete policies and economics involved in the control of the zoonotic diseases. It is seen that the awareness is low in the country about zoonotic diseases in general public and even in professional people. The medical fraternity is even lesser aware than veterinarians who are actually handling human zoonotic cases and hence, they are not recognizing or reporting these zoonotic infections (Kakkar *et al.* 2011). Above all there are many zoonotic diseases which are emerging or re-emerging and many of them are not so well established in the country like *Erysipelothrix rhusiopathiae*, Coxiellosis, Chlamyophillosis, Brucellosis, Salmonellosis by *S. Typhimurium* and *S. Enteritidis*, Campylobacteriosis, Bovine tuberculosis and many more. Most of the animal data for these diseases are not sufficient and there is also a lack of human data. The data of zoonotic diseases even if present are mostly limited to hospital based data or from urban or peri-urban places where the access to medical, veterinary and laboratory services are available. Most parts of India where actual interaction of zoonotic pathogen with animal and human occur are present in rural India, where 70% of the population resides. The North Eastern hill region of country is even more remote than rest of the country where access to medical, veterinary facility is even lesser. North Eastern hill states comprises of 08 states and Meghalaya is one of them. Meghalaya has one medical college, and no veterinary college, the research gap is filled by the ICAR RC NEH, Umiam for veterinary related research. The state machinery for medical and animal husbandry exist and has been working in collaboration with ICAR and other central departments. Here we attempted to give a clear picture for the existence of *E. rhusiopathiae* in swine population through a series of research. The report of disease outbreak followed by sero-epidemiological investigation showed the presence of the disease in the swine population of the state and warrants attention from both veterinary and medical departments to look into the cases of *E. rhusiopathiae* in the state.

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