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Some epidemio-clinico-pathological aspects of an outbreak of classical swine fever in a desert district from Rajasthan (India)

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Abstract. In summer of 2009 an outbreak of classical swine fever was recorded in Sahwa village, district Churu (Rajasthan), leading to death of about 80 pigs. The disease started after 3 weeks of introduction of new piglets in the population and it affected initially young ones and then adult pigs. Only exotic crossbred pigs succumbed, while indigenous breed was not affected. The outbreak was diagnosed on the basis of epidemiology, typical clinical signs and post-mortem lesions, and later confirmed by laboratory tests. The disease was controlled by observing hygienic measures, proper carcass disposal, restricting the movement of pigs and by vaccinating the healthy pig population away from the epicenter of outbreak.
Key words: classical swine fever, epidemiology, clinical and pathological observations, outbreak, pig.

Rezumat. În vara anului 2009 p epidemie de gripă porcină clasică a fost înregistrată în satul Sahwa din districtul Churu (Rajasthan), care a dus la decesul a 80 porci. Boala a debutat la 3 săptămâni după introducerea de godaci noi în populaţie şi a afectat iniţial porcii tineri şi apoi pe cei adulţi. Doar rasele exotice de porci hibrizi au decedat, în timp ce rasele indigene nu au fost afectate. Epidemia a fost diagnosticată pe baze epidemiologice, semne clinice tipice şi leziuni evidenţiate la necropsie, şi a fost confirmată de teste de laborator. Boala a fost stopată prin măsuri igienice, distrugerea corectă a cadavrelor, restricţionarea libertăţii de mişcare a porcilor şi vaccinarea populaţiei porcine sănătoase care se afla departe ce epicentrul epidemiei.
Cuvinte cheie : febră porcină clasică, epidemiologie, observaţii clinice şi patologice, epidemie, porc.

Introduction. Classical swine fever (CSF) is a serious and contagious viral disease of pigs and wild boars with a widespread worldwide distribution. It is an economically important infectious disease of pigs caused by an RNA virus belonging to family *Flaviviridae*, genus *Pestivirus*. The severity of CSF infection is believed to be determined by different factors, including the virulence of the strain as well as factors related to the host (Nielsen et al 2010) and the virulence of CSF virus strains ranges from avirulent to highly virulent (Mayer et al 2003). Vaccination is used for prophylaxis purposes, but in European countries, especially European Union, vaccination is prohibited. The epidemiological investigations along with data collection in such outbreaks are very important as epidemiological modeling is increasingly used to evaluate control options (Paton and Greiser-Wilke 2003). Boender et al (2008) used epidemiological data and proposed a calculation procedure to map out "high-risk areas" for local between-herd spread of CSF virus as a tool to support decision making on prevention and control of CSF outbreaks.

Classical swine fever has a world-wide distribution involving 44 swine-producing countries on all continents except North America and Australia (OIE 1996). Reports about Asia are incomplete, but the disease is believed to be present in swine-producing areas

(Gregg 2002). The disease has been reported from different parts of India from time to time (Bhattacharya 2001; Kumar et al 2007) but from Rajasthan, a hot desert (Thar) state, reporting of disease outbreaks is very rare hence making it extremely difficult to use epidemiological modeling to develop control strategies. The present paper puts on record an outbreak of swine fever from a desert district in Rajasthan (India).

Case History. A disease outbreak was reported to this centre in the month of May 2009 causing mortality in pigs in Sahwa village in Churu district (Rajasthan). The diagnostic team visited the affected areas, collected the epidemiological data, examined the animal houses, interacted with the pig raisers and collected the history in regards to pig population, susceptible age, time of onset of the disease, clinical signs, course of the disease, morbidity, mortality, introduction of new animals in the pig population and / or any other observation recorded by the pig raisers.

During the period of outbreak environmental temperature was high, on average 45-48^{0}C, with severe heat waves and very low humidity. In the village, total pig population was around 500 heads owned by many different farmers each having group of 5 -15 pigs. The animals were confined in small mud houses during night and in the morning the animals were let loose to roam around in search of food. These animals were not being fed any extra diet by their owners except little kitchen left-over available with them. The owners usually did not know much about health of their animals during the day time and could come to know about it only during evening hours when animals returned back. The animals were not vaccinated against swine fever.

The farmers revealed that 3 months prior to our visit some exotic crossbred piglets were purchased from nearby village and after about 3 weeks of introduction of new pigs in the population, the disease started in the population. Initially young ones died and then some adults also died. Since then there were intermittent deaths of pigs and by the time of visit around 80 animals had died. It was also recorded that only exotic crossbred animals died and that indigenous breed of the pigs did not suffer. The farmers also reported that many pigs also died with similar clinical signs in the herd from where purchases were made. No animal species other than the pigs were affected with the disease.

The affected pigs were examined clinically and post-mortem examination was conducted on available carcasses on the day of visit. Blood samples were collected from vena cava cranialis puncture from live animals and various tissues were collected from dead animals during post-mortem examination for further confirmation of the disease in laboratory.

Field Investigations

Clinical observations. During the outbreak, the indigenous pigs did not suffer, but only exotic cross-bred pigs got affected. At the onset of the disease many piglets died without showing any clinical signs and later on the adult pigs got affected. The pigs were dull, depressed, off feed and had very high body temperatures (up to 104^{o}F). They had diffused purplish discoloration of the skin usually below the abdomen, on inner aspect of thighs and ears. They were disinclined to move and when forced to move they showed swaying gait. The affected pigs had arched back, piled on top of each other in the corner and tail was hanging down (Fig. 1). Yellowish diarrhea was seen in some animals, few had blood in their faeces and some animals vomited. Animals in terminal stages showed convulsions, paddling of limbs, muscle tremors and incoordination. Death of the affected pigs was seen at variable period of time but usually after 4-5 days of exhibition of clinical signs.

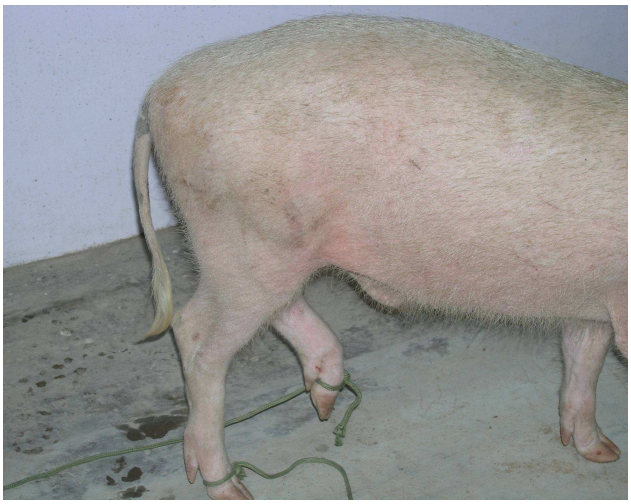

Figure 1. Pig with tail hanging down.

Post-mortem examination. The gross examination of the carcasses revealed presence of haemorrhages below the skin at various body parts especially below the abdomen (Fig. 2), inner aspect of the thighs and ears. The examination of internal organs revealed petechial haemorrhages in lungs (Fig. 3) and froth present in trachea, liver was congested and enlarged, large intestines were haemorrhagic (Fig. 4) with button ulcers on mucosal surface, kidneys were severely congested (Fig. 5) and had pin point haemorrhages (turkey-egg kidney, Fig. 6), lymph nodes were severely congested and enlarged (strawberry lymph nodes, Fig. 7) and gall bladder showed haemorrhages (Fig. 8). Spleen showed marginal infarction (Fig. 9).

Figure 2. Haemorrhages below the skin of abdomen.

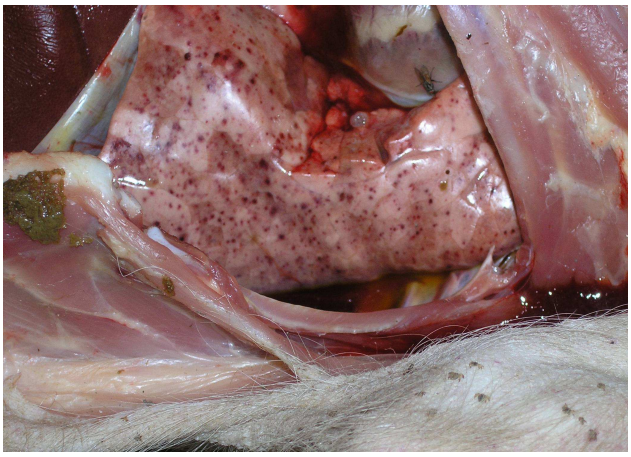

Figure 3. Lungs with petechial haemorrhages.

Figure 4. Haemorrhagic large intestine.

Figure 5. Severely congested kidney.

Figure 6. Congested kidney with pin point haemorrhages (Turkey- egg kidney).

Laboratory Investigations. The haematobiochemical examination revealed severe leucopnoea, hypoproteinemia and neutrophilia and the tissue samples (liver, lung, spleen, kidney, intestine, lymph nodes) were found positive for classical swine fever virus by immunohistochemistry and CSF virus genome by Real-time PCR. The histopathological lesions were also suggestive of CSF.

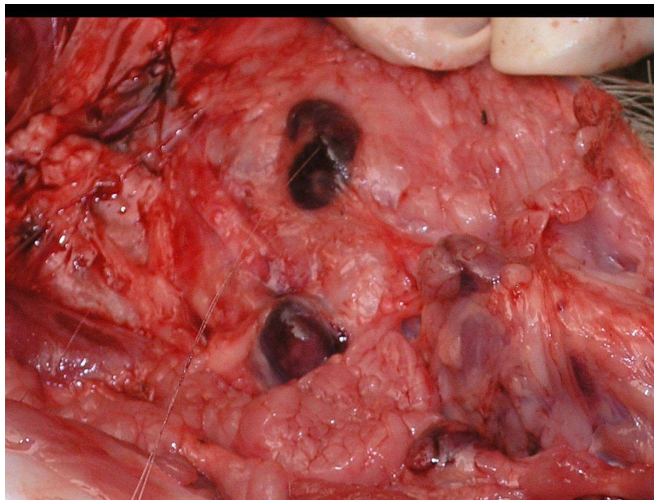

Figure 7. Pharyngeal lymph nodes with strawberry appearance.

Figure 8. Haemorrhages in gall bladder.

Figure 9. Marginal infarction in spleen.

Diagnosis. The epidemiology, clinical signs, post-mortem findings and laboratory examination confirmed the outbreak due to swine fever.

Control. A successful control and eradication program for classical swine fever can consist of zoosanitary measures and/or vaccination (de Smit 2000). The affected animals were immediately isolated and disposal of carcasses was carried out by burning or very deep burial. The diarrhoea and vomitus contents were cleaned immediately from the houses and floors were sprayed with disinfectants. Movement to and from infected areas was checked for next 6-8 weeks. The pig houses and utensils were disinfected by strong chemical disinfectants. In order to control secondary bacterial infection suitable

antibiotics were used in the sick as well as in contact animals. The healthy pig population was vaccinated for swine fever.

Discussion. The present paper records some of the epidemiological data during the outbreak which can be useful tool in area-specific designs of control strategies. The disease outbreak was recorded in month of May during which the environmental temperature was very high with lowest humidity suggesting the survivability of virus at very high temperatures. The virus is very resistant and survives for longer periods in infected meat, decomposing organs and blood and also survives wide range of pH from 3 to 11 (Radostits et al 2007).

The origin of disease was ascertained to be the place of purchasing the animals and then lateral spread of the disease. Likewise, Mackinnon (2001) recorded outbreaks of classical swine fever in East Anglia in 2000 and found the outbreaks occurred as a result of incorporation of weaners from an outdoor farm which was origin of the infection.

Fritzemeier et al (2000) found that out of 327 outbreaks occurring between 1990 and 1998 in Germany, 28% of these were primary outbreaks, most of which were caused by direct or indirect contact with infected wild boar or swill feeding. Similarly, Schnyder et al (2002) reported that virus can be transmitted from wild boar (*Sus scrofa*) to domestic pig (*Sus scrofa domesticus*). Likewise, in most of the outbreaks the primary outbreaks were ascribed to contact with wild boars but in the present case there was no apparent contact with wild boars. However, the study suggested that indigenous pig population may act as persistent source of infection to other exotic cross-bred pigs and needs to be taken into account as an important factor of an outbreak in affected areas. However, in such situation the elimination of virus from indigenous pigs will become a difficult task as the poor pig raisers do not accept vaccination or any other strategy and they argue that these animals do not suffer from the disease.

The disease first started in young animals with higher mortality as compared to the adult pigs suggesting the age to be an important factor in the occurrence of disease. This has been also reported by Kumar et al (2007) in outbreaks of CSF in pig from Punjab state in India. Nielsen et al (2010) also observed that there was more pronounced depletion of B cell and a number of T cell populations in peripheral blood in the 6-week old pigs in comparison to 11-week old pigs.

The clinical signs exhibited by the affected animals in the present outbreak were similar to those described by Gregg (2002) for classical swine fever caused by highly virulent virus which has been described to be now relatively uncommon. The necropsy observations are similar to those observed by other workers (Saini et al 2000, Bhattacharya 2001, Kumar et al 2007).

The European Community has an eradication program for CSF which no longer permits routine use of vaccines, relying instead upon restricting the movements of pigs in areas surrounding outbreaks, forwards and backwards tracing of virus spread, and slaughter of all affected herds (Lowings et al 1999). Similarly, Roic et al (2006) suggested that one of the biggest problems in the control of the disease spread was animal movements. In the present outbreak also, the unrestricted movements of pig in search of food in the village caused spread of infection in pig population which was later restricted and situation was brought under control. However, the restriction of movement is not always possible as the pig industry is not an organized one in this area and is generally practiced as backyard business by poor people only.

In most of the European countries vaccination against CSF is banned, however, it is still used as one of the measures in control of this infection (van Oirschot 2003). In the present outbreak further spread of the disease was checked by vaccinating the healthy population in the nearby unaffected areas.

Conclusions. An outbreak of classical swine fever occurred in a desert district with very high environmental temperature which started with the introduction of new piglets in the population causing mortality in exotic cross-bred but not in indigenous pigs. The classical clinical signs and post-mortem findings were observed. The disease was controlled by zoosanitary measures, restriction of movements and vaccination of healthy population.

The study emphasizes importance of epidemiology, clinical and pathological observations to diagnose the disease during outbreaks in field.

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