

OUTBREAKS OF PORCINE PARVOVIRUS DISEASE IN PANAMA

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SUMMARY

The first recorded isolation of porcine parvovirus (PPV) in Panama is described. The outbreaks of PPV disease were characterised by a high prevalence of mummified foetuses, stillborn and weak pigs and a common source of exposure. Diagnosis was based on virus isolation and by demonstrating viral antigen in lungs of affected foetuses. Six farms in four different provinces were involved. Rapid control of the epizootic was achieved through the use of an inactivated PPV vaccine in the affected farms.

INTRODUCTION

Porcine parvovirus (PPV) is a major cause of reproductive failure for the swine industry worldwide (Mengeling, 1984). PPV infection in a susceptible herd produces embryonic and foetal death with resorption, mummification, small litter sizes and stillborn piglets (Mengeling, Cutlip and Wilson, 1975; Mengeling, 1984; van Leengoed, Vos and Gruys, 1983). Few studies on PPV have been done in Latin America but antibodies to the virus have been detected in pigs from Brazil (Gouveia, Gomez and Reis, 1984), Argentina (Fondevila and Schudel, 1985) and Mexico (Rodriguez-Villela, Lara-Sagahon, Machin, Aguilar-Setien and Carrasco, 1988), and one PPV outbreak in Uruguay has been confirmed by virus isolation (Guarino, Sienre and Vargas, 1985).

The aim of this report is to record the first documented epizootic and isolation of PPV in Central America. During the course of this study difficulty was encountered in gathering complete epizootiological data. On 15 January 1987 a mummified pig foetus was submitted to the Panamanian Ministry of Agriculture Veterinary Diagnostic Laboratory by a veterinarian who suspected leptospirosis. The farm from which the foetus was submitted (farm 1) had 265 sows and reported 18 litters in which the foetuses were completely or partially mummified (Table 1). The owner of this farm had imported several sows and boars from Georgia and Illinois, USA, during 1983 and in November 1986.

On 10 February 1987 farm 2 with 567 sows, 10 km south-east of farm 1 reported 72 litters in which the foetuses were completely or partially mummified out of 140 litters farrowed. Three mummified foetuses and two live-born weak piglets from a partially mummified litter were submitted for diagnosis (Table 1).

Other farms sent material to the laboratory as follows: on 27 February farm 3, 250 km south-west of Panama City reported six mummified litters and sent two mummified foetuses for diagnosis. On 15 June farms 4 and 5 with 150 sows, each located 250 km west of Panama City, also reported 10 mummified litters out of 41 litters farrowed and nine mummified litters out of 26 litters farrowed respectively; six mummified foetuses were submitted for diagnosis. Farm 4 acquired sows and

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TABLE 1

Chronology and rates of mummification of the 1987 PPV epizootic in Panama

Farm no.	1 ¹	2	3	4	5	6
No. of sows & gilts	265	567	85	150	150	55
No. of mummified litters/total litters farrowed ²	18/ND	72/140	6/ND	10/41	9/26	14/17
Mummification rate %	ND	51.4	ND	24.3	34.6	83.3
USA						
Nov 86	Jan 15	Feb 10	Feb 27	Jun 15	Jun 15	Jun 29

¹ = index case.² = mummified litters include complete or partially mummified litters.

ND = not determined.

→ = movement of pigs between farms.

boars during the last months of 1986 from farm 1 and in addition sold a boar to farm 3. On 29 June farm 6 300 km south-west of Panama City reported 14 mummified litters out of 17 litters farrowed and sent two mummified foetuses for diagnosis.

On 13 March 1987 a cytopathic viral agent was isolated from the lungs of a mummified foetus from farm 1 using swine kidney cell tissue culture, but it was not until 9 April that PPV was confirmed using immunofluorescence and haemagglutination inhibition (HI) as the probable cause of the epizootic. Vaccination started on 15 April on farms 1 and 2 and those nearby. All the gilts, boars and non-pregnant sows were vaccinated with an inactivated PPV vaccine (Fort-Dodge, Parvo-Lepto Killed vaccine, Iowa, USA) (Mengeling, Brown and Paul, 1979; Brown, Witacre and Robinson, 1987). The outbreak was gradually brought under control and no further mummified litters were reported approximately three months later when the investigation ceased.

MATERIALS AND METHODS

Viral isolation and identification

Lungs from three mummified foetuses (farm 2) were ground up and diluted to 10% in phosphate buffered saline (PBS) pH 7.2 that contained penicillin and streptomycin and inoculated into 45% confluent monolayers of primary swine kidney cells (Peev, Motovski and Aleksandrov, 1986). A suspension of ground up lung, spleen and kidney from two live-born weak piglets from farm 2 was inoculated into a 75% confluent primary swine kidney cell culture. The inocula were adsorbed to the cell culture for 30 minutes. Minimal essential media plus 10% foetal calf serum and antibiotics were added to the cell cultures and observed daily for cytopathic effect (CPE). Supernatants were harvested when CPE was observed or, if negative, at seven days post-inoculation (PI).

Supernatants and lung suspensions were tested for haemagglutination (HA) using a 0.5% suspension of guinea-pig red blood cells. Positive HA samples were confirmed for PPV by HI using specific PPV antisera (National Veterinary Diagnostic Laboratory USDA, Ames, Iowa, USA) (Cottral, 1978).

Immunofluorescence

Lungs from mummified foetuses and live-born weak piglets were tested for the presence of PPV viral antigen by direct immunofluorescence. Frozen sections six to eight μm thick were fixed in chilled acetone. They were then incubated in a humidified chamber at 37°C for 30 minutes with a 1/32 dilution of a PPV conjugate (National Diagnostic Laboratory USDA, Ames, Iowa, USA). They were subsequently washed in PBS pH 7.2 for 10 minutes, rinsed in distilled water for one minute and mounted in buffered glycerine for observation with a fluorescent microscope.

Brucellosis and leptospirosis

Sera collected from 881 sows and boars from farms 1 and 2 were tested for *Brucella* antibodies. Twenty sera randomly selected from farm 2 were tested for leptospiral antibodies. Twelve rats (*Rattus rattus*) trapped on farm 2 were killed and their kidneys and urine inoculated into PLM 5X (Armour Pharmaceutical Company, Kankee, Illinois, USA) liquid media for leptospiral isolation and observed up to 90 days PI. Four samples of sows' urine from farm 2 were also cultured as described above for leptospiral isolation.

RESULTS

Viral isolation and identification

The lung suspension from one of the three mummified foetuses produced CPE four days PI but neither of the live-born weak piglets from farm 2 did so. Positive HA and HI with specific PPV antisera confirmed that the agent was PPV. All of the lung suspensions from the mummified foetuses were positive for HA and HI.

Immunofluorescence

Immunofluorescent, well defined foci were identified throughout the lung parenchyma of the mummified foetus but not in the lungs of the two live-born weak piglets. The specificity of the test was confirmed by blocking the fluorescence in the frozen lung tissue sections with 1/10 diluted PPV specific antisera.

Brucellosis and leptospirosis

All sera tested for brucellosis and leptospirosis gave negative results. Attempts to isolate *Leptospira* from sows' urine or rat organs were negative.

Epizootiology

Prevalence rates for completely and partially mummified litters varied between 24.3% for farm 4, 34.6% for farm 5 and as high as 51.4% for farm 2 and 83.3% for farm 6 (Table I). The interval between submission of the first sample and laboratory diagnosis was 85 days and that between laboratory confirmation and start of vaccination was 10 days.

DISCUSSION

Although PPV has been reported to be ubiquitous in pigs around the world (Mengeling, 1984) to the best of our knowledge it has never been reported in Panama. The PPV outbreaks in Panama may have started as a result of the

importation of carrier sows and boars from the USA and the subsequent exposure of a susceptible population to the exotic virus. This could explain the rapid spread and almost simultaneous occurrence of the disease in different areas of the country and the fact that not only were gilts affected but also sows of all ages. A similar explosive outbreak of disease in Panama due to the importation of sows and boars from the USA was observed by Obaldia, Contreras and Olson (1986), during an epizootic of swine dysentery, even though it was recognised to be enzootic in other countries (Harris and Glock, 1984). This supports the thesis that this PPV epizootic was an imported disease.

Virus isolation was less effective than immunofluorescence or IIA in detecting PPV in mummified foetuses during this study. Only one out of three samples from mummified foetuses lungs yielded virus whereas all those examined by immunofluorescence and IIA were positive. Similar observations have been made by Mengeling (1984). The specificity of the IIA and HI of the swine kidney cell tissue culture supernatant fluids and lung suspensions, together with the immunofluorescent foci observed in the lungs of all mummified foetuses, which could be blocked with specific PPV antisera confirmed the isolation of PPV (Mengeling, Cutlip and Wilson, 1975; Mengeling, 1978).

The rates of complete and partially mummified litters observed during this PPV epizootic were substantially above the 1% tolerance limit of mummified foetuses which is considered to be indicative of reproductive failure in a swine herd (Vinson and Muirhead, 1984). Although we could not establish a case-control study and our epizootiological data was incomplete, the PPV inactivated vaccine was effective in rapidly controlling the spread of the disease. Serological studies will be conducted in order to determine the prevalence of PPV infection in Panama.

ACKNOWLEDGEMENTS

I thank The United States Department of Agriculture, (National Veterinary Diagnostic Laboratory, Ames, Iowa) for supplying the biological material used for diagnosis and the laboratory and field personnel from the Ministry of Agriculture and Livestock Development of Panama for their technical assistance.

Accepted for publication August 1990

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FOYERS DE PARVOVIRUS PORCIN (PPV) AU PANAMA

Résumé—Pour la première fois l'isolation d'un parvovirus porcin au Panama est décrite. Les foyers de cette affection ont été caractérisés par la présence, en grand nombre, de foetus momifiés, de porcelets mort-nés ou très fragiles et une origine commune de contamination. Le diagnostic a reposé sur l'isolement du virus et la reconnaissance de l'antigène viral dans les poumons des foetus. Six élevages dans quatre provinces différentes ont été touchés. L'épizootie a été rapidement maîtrisée grâce à l'emploi d'un vaccin parvovirus porcin dans les élevages atteints.

BROTOS DE PARVOVIROSIS EN PANAMA

Resumen—Se describe el primer aislamiento de parvovirus porcino (PVP) en Panamá. Los brotes se caracterizaron por una prevalencia alta de fetos momificados, mortinatos y recién nacidos débiles; todos tuvieron una fuente común de exposición. El diagnóstico se basó en el aislamiento del virus y en la demostración del antígeno viral en pulmones de los fetos abortados. Seis porquerizas en cuatro provincias diferentes estuvieron involucradas. La enfermedad se controló rápidamente en las granjas problema, mediante el uso de una vacuna inactivada de PVP.