Journal of Animal and Veterinary Advances 5 (12): 1058-1061, 2006

Observations on the Pigeon Paramyxovirus-1 Infection in Pigeons at Al-Ahsa Oasis of Eastern Saudi Arabia

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Abstract: This study investigates on some epidemiological features of the pigeon paramyxovirus-1 (PPMV-1) infection, in pigeons, at Al-Ahsa oasis of eastern Saudi Arabia (S.A.). Al-Ahsa oasis was chosen, for this study, because of its historic reputation for pigeon breeding. On the other hand, there are large numbers of pigeons at Al-Ahsa as compared to other parts of S.A. The PPMV-1 is the most serious pigeon malady in the country. The study included historic information about the pigeon breeds and the way they are kept, whether confined or free-flyers and their contact with other avian species (feral or domestic). The disease outbreaks were also investigated. Information regarding the clinical signs, the age groups affectedand the distribution of the outbreaks throughout the year were collected. The epidemiological situation of the disease was wrapped up and discussed.

Key words: Epidemiological observations, PPMV-1, eastern Saudi Arabia

INTRODUCTION

The PPMV-1 causes specific disease of pigeons which appeared as a scourge in Europe during the early eighties[1], but it seemed to had been smouldering in the Middle East since the seventies of the last century[2]. The disease is caused by a variant of the Newcastle diseased virus[1]. The virus caused great losses in various parts of the world[1]. Pigeons have always been the primary target of the disease. However, the virus was isolated from apparently healthy other feral avian species e.g., doves[3].

In S.A., the disease was firstly reported in the early nineties[4,5]. Subsequently, it was recorded in other parts of the country. No other avian species was reported to suffer from the natural disease in S.A. The present study, is the first of its kind in S.A. Al-Ahsa oasis is the largest oasis in S.A.. It is rich with water and agricultural activity.

It has the most extensive date-palm plantation in the Arabian Peninsula. So, feral birds e.g. doves come from various regions of S.A., seeking food and water. Al-Ahsa domestic pigeons are kept as fancy birds. Some are of high prices and are procured from other countries. There is a good deal of mingling between pigeons and other feral avian species in the oasis.

MATERIALS AND METHODS

Field investigations: The best places, at Al-Ahsa oasis, from which information about pigeons can be gathered, are the fancy birds' markets. In these markets there is information about pigeons in health and disease, their breeds, locations of breeders and fanciers and places of the major pigeon yards. So, Contact information of the pigeon breeders and fanciers, was gathered from people in these markets.

Investigations of the PPMV-1 disease outbreaks at Al-Ahsa: This investigation was carried out during 1995 at Al-Ahsa oasis of Eastern Saudi Arabia. Since most of the pigeons, at Al-Ahsa oasis, are in the hands of the fanciers and breeders, the investigation was directed towards them in pigeon yardsand bird markets. The veterinary clinic at Al-Ahsa was also contacted for information regarding the disease outbreaks in the area. The investigation involved recording the breeds of pigeons; the total number in each yard; the season of the year in which the outbreaks took place; the morbidity rate, the mortality rate, the sex and ages affected. Also whether the pigeons were in complete confinement or flying at intervals during the day and

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comeing back to their houses at dusk? Information about contact with other avian species (feral or domestic) was also noted.

Sampling: Samples were collected from pigeons showing nervous signs from different localities at Al-Ahsa. The collected birds were of different breeds, agesand sexes. The history of the flock was taken. Postmortem examination was performed in moribund pigeons and the samples were collected, as described by Al-Afaleq *et al.*[5] and kept at -86°C until used. Some organs were placed in 10% formol saline for histopathological examination, these included the brain, liver, kidneys, intestines, lungs and pectoral muscle.

Virus isolation in eggs and vero cells: Brain tissues were made into 30% suspension in Phosphate Buffered Saline (PBS) pH 7.4 and inoculated into 9-day old chicken embryos, as described by Hanson[6]. Dead eggs were collected, kept for 24 h at 4°C. The allantoic fluid was then collected, clarified by low centrifugation in the cold, antibiotics were added to it and stored at -86°C until used for virus identification.

Virus identification: The Haemagglutination (HA) and Haemagglutination Inhibition (HI) tests, as described by Hanson[6] were employed to identify the isolated viruses up to the *'Avian Paramyxvirus-1'* level. For further classification the virus isolates were sent to the World Reference Laboratory for *Avian Paramyxvirus-1*, at the Central Veterinary Laboratory (CVL), Weybridge, U.K.

RESULTS

Field investigations: Long ago, the local breed of pigeons "*Hasawi*" was nearly the only known breed present at Al-Ahsa. Now, many pigeon breeds; such as *Zagil*, *Raabi*, *Ketmi*, *Shammasi*, *Nagafi*, *Irani*, *Iraqi* and *Sudani* were introduced at AL-Ahsa. The *Hasawi* breed is very expensive and one pair may cost thousands of Saudi Riyals.

Pigeon houses are made from wooden boxes arranged in rows. A wooden box is rectangular or square in shape and has one circular or square opening on one side to allow pigeon entrance Fig. 1.

A pigeon yard may include other partners like chickens, rabbits etc. The netted fence of the yard might allow some feral birds, like sparrows and doves, to visit and come in contact with the pigeons, seeking food. Some pigeons are completely restricted in their yards; others are allowed to fly freely during the day; and collect back at dusk.

The number of pigeons per yard ranged from just less than hundred to over 500.

Fig. 1: Pigeon houses are made from wooden boxes arranged in rows. A wooden box is rectangular or square in shape and has one circular or square opening on one side to allow pigeon entrance

History of the disease at al-ahsa: Personal communication with pigeon keepers and field investigations of the disease offered valuable information regarding history of the disease in the area. According to elderly pigeon owners, at Al-Ahsa, clinical signs similar to those of the PPMV-1 infection had always been seen for the last 40-50 years and they linked between its first emergence in the area and the entrance of the imported foreign breeds of pigeons.

The pigeon owners agreed that most of the disease outbreaks occurred in summer. However, sporadic cases could also be seen throughout the year. The disease, as they observed, usually starts as a storm affecting almost all the flock i.e., morbidity reaching 100% and mortality may reach over 90%. All breeds and sexes were equally affected and all age groups were susceptible but young pigeons were affected most.

Pigeon fanciers also mentioned that, pigeons allowed to fly freely during the day, had greater chance of getting the infection and consequently they transmited it to the restricted ones.

According to the owners, small-size feral birds, such as sparrows, can pass through the netted fences of pigeon yards, but had nothing to do with the disease in pigeons. However, doves, which can also get entrance, seemed to play a role in transmission of the disease to pigeons. The owners agreed that, once doves visit their pigeon yards, for sometime, nervous signs are expected to be seen later in their pigeon flocks. Prediction of such a link between visits of doves and the appearance of disease in pigeons seems to be logical[3].

Fanciers, especially those keeping expensive pigeons, did not keep chickens with their birds, so, they had no idea whether they played any role in transmission of the disease in any way. One owner mentioned that he had noticed the disease in chickens, which were kept

Fig. 2: The ailing pigeons were listless, had raffled feather, in-coordination, anorexia, torticollis and were unable to fly

together with nervously affected pigeons. It is quite probable that, this owner did not distinguish between the clinical signs of both NDV and PPMV-1 in chickens and pigeons. So, what had been seen affecting both species, was highly likely a true NDV infection. This is because, under natural conditions, PPMV-1 is usually specific to pigeons,, while NDV can infect both species.

PPMV-1 suspected outbreaks in pigeons during the present study: Twenty three outbreaks were recorded during the study period. The disease affected all breeds of pigeons. There was no history of vaccination in the affected flocks. It was also noted that all the outbreaks occurred during the summer months (June-September). Clinically, the ailing pigeons were listless, had raffled feather, in- coordination, anorexia, torticollis and were unable to fly Fig. 2. Greenish diarrhoea was also seen. Some pigeons showed nodding and wing shaking. Within ten days from appearance of the clinical signs, the pigeons either died or recovered with paralytic sequelae. The morbidity rate ranged from 17-100%, while the mortality rate ranged from 9-100%.

The disease involved pigeons from the first month of age and above. It was noticed that pigeons aging 4-7 months were the main target of the disease.

Table 1 shows that neither confined pigeons nor those flying at intervals, during the day, could escape the infection.

All the pigeon yards, which experienced the PPMV-1 disease, were frequently visited with feral birds such as doves and sparrows. However, 72% of the affected yards had no contacts with apparently healthy chickens.

Virus isolation: Most of the embryonating eggs, inoculated with the original material died within 2-3 days post inoculation.

Table 1: The PPMV-1 infection in confined and free flyer pigeons

	Type of keeping	
No. of yards involved	Free flyers	Confined
23	13 (55%)	10 (45%)

Virus identification: The Haemagglutination test (HA) results indicated that seventy-five per cent of passage one in embryonating chicken eggs, gave HA positive results.

Haemagglutination Inhibition (HI): The HA activity of the isolated viruses were inhibited by the ND (avian paramyxovirus-1) hyperimmune serum. Eighteen avian paramyxoviruses were isolated. Seven of these virus isolates were sent to CVL,Weybridge for further classification.

The results obtained from the World Reference Laboratory at Weybridge, UK, confirmed that the isolated viruses belonged to the PPMV-1 group (P-group) which were distinct from the classical ND virus.

Gross pathological lesions: The Postmortem (PM) examination revealed general dehydration of the carcases. The brain and lungs were congested. The kidneys were oedematous. There was massive myocardial necrosis. Splenomegaly was conspicuous and some haemorrhogic spots were seen on the intestinal serosa and mucosa. There was also serous air saculilis.

Histopathological lesions: The lungs showed congestion and peribronchial round cell infiltration. The small intestines showed vacuolation of tunica muscularis, infiltration of tunica muscularis and infiltration of serosa.

In the caecum, there was mononuclear cell infiltration of muscular tunic. The Liver showed congestion, vascular degeneration, cellular infiltration of portal areas and bile duct hyperplasia.

In the Kidney there were cortical granulates, diffuse interstitial infiltration and tubular degeneration. The pectoralis muscle showed degeneration, necrosis, interstitial cell proliferation and haemorrhages. The brain depicted congestion and capillary proliferation. Neuronal degeneration, astrocytic proliferation and cerebral vacuolations (white matter) were also seen.

DISCUSSION

Results in the present study, demonstrated that the PPMV-1 is widespread at Al-Ahsa oasis. Pigeons of all breeds, exotic or local and both sexes were equally affected. The most affected age group was those

between 4-7 months; which could indicate the age in which maternal immunity was lost.

The results also indicated that most of the outbreaks were recorded in summer and this may have been due to heat stress.

It was of interest that 72% of the affected pigeons were not in contact with chickens; while 28% were not. This could be explained by that most of the pigeons, in-contact with chickens, might have been exposed, somehow, to the Newcastle (avian paramyxovirus-1) vaccine strains, which are routinely given to chickens. This exposure could have provided some protection in these pigeons against the PPMV-1. While the pigeons that were not in contact with chickens had not been exposed to vaccine strain and appear to have been fully susceptible.

As might be expected, the free-flying pigeons were likely to be more exposed to the PPMV-1 infection 55% than the confined birds 45%. This was, probably, due to mingling with other pigeons and avian species such as doves which may act as carriers of the virus[3].

It was observed that the 'bird markets' contained some pigeons showing torticollis. So, these markets could help in dissemination of the disease in the area. The fanciers were advised of the hygienic procedures they should follow when bringing their birds to these markets. It could be concluded that, Al-Ahsa being the largest oasis in the Arabian Peninsula, with ample supply of water and extensive agricultural activity, would be an attractive spot for feral birds (e.g., doves). These birds may also act as a source of infection to pigeons at Al-Ahsa and possible elsewhere in S.A.

In a recent study[7] on the susceptibility of the native dove *Streptopelia roseogrisae arabia* of S.A. to the PPMV-1, it was found that it develops a severe clinical form of the disease and can excrete the virus for at least 18 days.

ACKNOWLEDGEMENT

The authors would like to thank King Abdulaziz City for Science and Technology (KACST) for the M.Sc. grant. We would also like to thank the pigeon fanciers at AL-Ahsa bird's markets for their kind help and Mr. A. AL-Khars for assistance.

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