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Bordetella Bronchiseptica Vaccines in Pet Guinea Pigs? A Review of the Literature

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Abstract

Bordetella bronchiseptica causes severe respiratory disease in guinea pigs and it has been associated with stillbirths, abortions, infertility and infections of the reproductive system and tympanic bullae. Disease caused by *Bordetella bronchiseptica* in pet guinea pigs is mostly a poor understood disease; studies about this pathogen has been conducted mostly in laboratory guinea pigs. The objective of this review is to condense published information about the disease caused by *Bordetella bronchiseptica* in guinea pigs for the veterinarian who attends pet guinea pigs, with special emphasis on the prevention of this disease. The author concludes that vaccination in pet guinea pigs against *Bordetella bronchiseptica* needs to be considered for future studies.

Pathogeny

Bordetella bronchiseptica (Bb) is a gram-negative rod that has tropism for the ciliated respiratory epithelium. Infected pet guinea pigs can eliminate the bacteria, become asymptomatic carriers or develop the disease. The pet guinea pigs that develop the disease usually are attended at the veterinary clinic showing nasal and ocular discharge, respiratory sounds and dyspnea; the inappetence and lethargy indicate a poor prognosis. The diagnosis and treatment is based on deep nasal culture and antibiogram. Guinea pigs that have contact with the diseased guinea pig should be separated and occurrence of clinical signs should be monitorized at least until the diseased guinea pig has been cured. It is good practice to perform x-rays of the head and chest of the guinea pigs that are in contact with the diseased ones because a subclinical or early-stage disease can be detected [1-3].

Bordetella bronchiseptica causes severe respiratory disease in guinea pigs, firstly described at the end of the 19th century [4] (Figure 1). Stillbirths, abortions, infertility and infections of the reproductive system can occur if haematonous spread of the bacteria develops; also the tympanic bullae may contain purulent exudates in affected animals due to ascending infection [1,5,6] (Figure 2,3). The incidence of Bb in a colony is usually 20% lower in laboratory animals if no action is taken, but this incidence is unknown in guinea pigs [7]. Disease caused by Bb in pet guinea pigs is mostly a poor understood disease because what is known of the disease is mostly by studies conducted in laboratory guinea pigs, and not in pet guinea pigs [1-3].

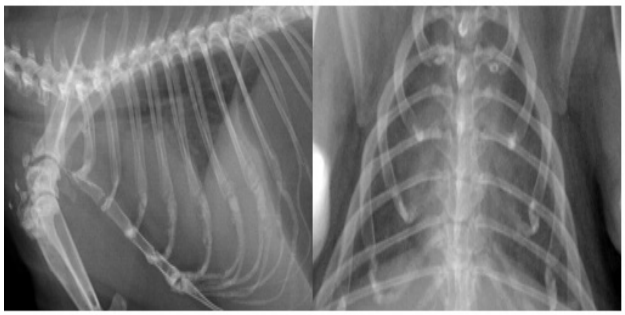

Figure 1: Laterolateral and ventrodorsal views of thoracic radiographs from a pet guinea pig with pneumonia. Necropsy tissues were submitted, the pulmonary interstitium presented infiltration of heterophiles and macrophages and the microbiological culture was positive for *Bordetella bronchiseptica.*

Figure 2: Stillbirths associated with *Bordetella bronchiseptica* infection in guinea pigs. In the case showed in this image, the deep nasal culture of the mother was positive to *Bordetella bronchiseptica.*

Figure 3: Dorsoventral view of a skull radiograph from a pet guinea pig with facial nerve paralysis. Severe radiodensity of the right tympanic bullae is noticed. The culture of the right tympanic bulla taken at necropsy was positive to *Bordetella bronchiseptica.*

Nakagawa (1969) describes the respiratory disease produced by Bb in guinea pigs as being low virulent with little or no mortality [7]. Others describe epizootic outbreaks with high virulence and mortality [6,8]. As we will see later, there are several factors that may influence these discrepancies, including the bacterial strain.

Transmission of the disease among guinea pigs requires close contact; by aerosols, nasal secretions and fomites [5,8]. Susceptibility is greatest in young animals and incubation period was founded to be of 5-7 days [6,7].

As guinea pigs seems to be more sensitive to the pathogen than rabbits, and rabbits are frequent asymptomatic carriers and cohabitants in homes and animal shops, it is advisable not to keep them in close contact [5]. In addition, Bb has been isolated in 18 species of mammals associated with respiratory disease, the elimination of the pathogen lasts a long time in animals and there is a high percentage of asymptomatic infections [9]. For these reasons it is very possible that the disease may be quite common in pet guinea pigs, being able to act as reservoir of the bacterium.

Bordetella bronchiseptica is more pathogenic and less host specific than *Bordetella pertussis* and B*ordetella parapertussis,* both of which cause generally mild disease in man and both evolved from a common ancestor similar to Bb, which lost virulence and gained adaptation [10]. The three bacteria are the only pathogens of the entire *Bordetella* genus and cross-immunity between the three is proved [11-13].

In guinea pigs, maternal immunity seems to be effective during the first four weeks, but youngs may be seropositive up to 8 weeks of age [14].

The development of the disease may be related to stressors such as inadequate diet, concurrent diseases, inadequate environmental conditions, pregnancy, overcrowding, etc., [15]. Animals recovering from the disease may be asymptomatic carriers, being immunized but also representing a source of infection for other animals [8,16-21].

Vaccines

To maintain a guinea pig colony free of Bb, it is considered that only pathogen-free animals should be introduced [5].Vaccination seems to not prevent asymptomatic carrier status because after infection in vaccinated animals the bacteria in the upper respiratory tract of some animals are isolated, although vaccination avoids disease [11,14,17-19]. In pet guinea pigs the only feasible possibility of preventing the disease is vaccination.

Published papers on vaccine prophylaxis relate to laboratory animals and most of these papers study experimental vaccines available only for laboratory animals [6,14,17]. These vaccines are not an option in pet guinea-pigs, however, commercially approved dead commercial vaccines approved for use in dogs, pigs and people were successfully evaluated in laboratory animals [18,22].

Vaccines best considered against Bb infection in other species are live attenuated by intranasal or oral application: they induce both local immunity at nasal level (IgA) and seroconversion (IgG), only one application is needed to produce longtime immunity, effective immunity is achieved rapidly (up to 72 hours) and do not provoke local reactions [23-31]. Local nasal immunity (IgA) appears to be of crucial importance in respiratory infectious diseases, particularly if *Bordetella spp*. is implicated [17,23,32,33].

Treatment

Various treatment protocols have been proposed in pet guinea pigs based on support therapy, systemic antibiotherapy (best based on bacterial culture and sensitivity testing) and chamber nebulization with antibiotic but effectiveness of these treatments have not been proven [1-3].

Conclusion

Vaccination in pet guinea pigs against *Bordetella bronchiseptica* must be considered for future studies.

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