Study of the pathobiology and viral dispersion of recent HPH5Nx strains within poultry flock through the development of a punctual introduction model

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Abstract

At the end of the 20th century, the emergence of a highly pathogenic H5 reassortant influenza virus able to infecting and spreading among wild waterfowl was observed. As a consequence, the possibility of direct HPAI introduction into poultry flocks after contact with infected wild birds, instead of HP emergence resulting from cleavage site mutations of a LPAI-H5 virus, has urged a re-thinking of how to monitor and protect our poultry flocks. Since 2010, HPH5 strains of the clade 2.3.4.4. emerge regularly in Europe and circulate, reinforcing the importance to increase knowledge on pathobiology of these viruses and anticipation of their appearance and dispersion. Animal models mimicking as close as the field situation such as a punctual introduction of HPH5Nx within a naïve population was lacking. This model was developed by varying the number of infected individuals, the inoculated dose and the number of naive individuals placed in contact, following infection with clade 2.3.4.4. B HPH5N8_2017 (A/BrahmaChicken/Belgium/6153/2017) strain. This model was validated with a recent strain isolated in 2020, (A/Anser_albifrons/Belgium/11956_005/ 2020) showing by comparison with the 2017 HPH5 strain, an increased virulence and a faster dispersion within contact birds. Moreover, the impact of a H5 pre-immunization of the contact birds (induced by Reverse-Genetic HP/LP H5N8_2017 inoculation) on the infection either with homologous (HPH5N8_2017) or heterologous (HPH5N8_2020) viral strains was characterized in this model. No morbidity or shedding were observed in pre-immunized contact birds exposed to birds infected with the homologous HPH5N8_2017 strain, while 20% mortality and tracheal and cloacal sheddings were observed in pre-immunized contact birds exposed to birds infected with the recent HPH5N8_2020 strain, emphasizing the risk of a silent circulation of HPAI within poultry flocks submitted to recurrent HPAI incursions.