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Experimental infection of mute swans with highly pathogenic avian influenza virus H5N1

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Mute swans (*Cygnus olor*) were often affected with a high case fatality rate during outbreaks of HPAI H5N1 in wild birds. We therefore infected two groups of mute swans with a low and a high dose of highly pathogenic avian influenza virus A/*Cygnus cygnus*/Germany/R65/2006 (HPAIV H5N1). After an incubation period of four days clinical signs could be first observed including severe neurological disorders like ataxia, torticollis and opisthotonus, or acute death. Shedding of high viral loads was detected from all swans in oropharyngeal and cloacal swabs for up to six days per animal, and eleven out of twelve naïve mute swans died between five and fourteen days after inoculation. Interestingly, two animals with pre-existing antibodies against avian influenza virus survived, although viral shedding was detected in both animals. In contrast, naïve individuals despite developing high titers of neutralising antibodies after infection succumbed to the disease. Three swans showed widespread endothelial dispersion of viral antigen and succumbed rapidly; these animals did not mount AIV-specific antibodies following virus inoculation. In all swans presenting clinical signs and AIV-specific antibodies, immunostaining was exclusively positive in surface and parenchymal epithelia and neuronal tissue. We concluded that swans (1) are highly susceptible to infection with HPAIV H5N1, (2) excrete significant viral loads for several days and can therefore play an important epidemiological role in the spreading of HPAIV H5N1, and finally (3) can be clinically protected by pre-exposure immunity.

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