Zoonoses and Emerging Viruses

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Avian influenza H7N9/13 and H7N7/13: A comparative virulence study in chicken, pigeons, and ferrets

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In the last years several outbreaks of low and highly pathogenic avian influenza viruses (AIV) of subtype H7 occurred in poultry with sporadic transmission to humans. Recent outbreaks of human cases caused by a novel avian H7N9 virus in China emphasize the zoonotic potential of that subtype. Therefore, we compared the infectivity and pathogenicity of the novel avian H7N9 virus and a H7N7 strain recently circulating in poultry farms in Germany in avian host species (chicken, pigeon) and a mammalian model species (ferret). Both viruses did not induce any signs of disease in any of the species tested despite florid replication in inoculated chickens and transmission to contact chickens. Replication of both viruses in pigeons, although to lower RNA loads compared to chickens, was also detected. No clear-cut differences between the two H7 isolates were evident regarding replication in avian hosts. In ferrets, in contrast, enhanced replication of the avian H7N9 virus compared to the H7N7 was observed. Importantly, both viruses showed potential to spread into the brain of mammals. We conclude, that efficient asymptomatic shedding by avian hosts facilitate spread of H7 viruses, which may harbor a zoonotic potential. Biosafety measures are required in handling poultry infected with subtype H7 AIV independent of their pathogenicity for gallinaceous poultry.

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Point-of-entry screening system for the detection of avian influenza A (H7N9) virus in six minutes using recombinase polymerase amplification assay

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Avian influenza A (H7N9) virus mainly infects birds and occasionally humans get infected. As of December 22th 71 deaths of 166 laboratory confirmed human cases have been recorded by the WHO. Hitherto, H7N9 virus is restricted to parts of China including Hong Kong. However, the virus may spread from China to other countries. Thus it absolutely necessary to detect a H7N9 outbreak as early as possible to initiate the appropriate control measures and prevent further spread among birds or transmission to humans. In this study, we describe the development of a reverse transcription recombinase polymerase amplification (RT-RPA) assay for the detection of H7N9 virus. A dilution range of 10^7-10^1 RNA molecules/µl of the H7 and N9 RNA standards were used to determine the analytical sensitivity of RT-RPA assays. Sensitivities of H7 and N9 RT-RPA assays set up individually 16 and 179 RNA molecules, respectively. In contrast, multiplexing the H7 and N9 assays yielded a lower sensitivity of 10^4 RNA molecules. The RT-RPA assays were performed at a single temperature (42°C) using a very small portable device of less than 1kg. RT-RPA assays were very fast and yielded a result in 2-6 minutes. The H7N9 RT-RPA assays showed neither a cross-detection with any other respiratory viruses affecting humans and/or birds nor of the human or chicken genomes. The developed isothermal real-time RT-RPA assays are ideal for rapid mobile molecular H7N9 virus monitoring in patients as well as in chicken and could be easily used to perform rapid viral on-site diagnostic at quarantine stations, farms and rural hospitals.

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Zoonotic Parapoxvirus infections associated with game animals in the Tyrol region of Austria and Italy

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Parapoxviruses occur world wide in domestic animals like cows, sheep or goats and sometimes also lead to zoonotic infections of humans, especially in farmers or veterinarians. Data about the overall prevalence are lacking in most areas, due to the lack of reporting and the mostly benign and self limited course of the infections. However more severe generalized infections have been observed in potentially immunosuppressed individuals also in our area. There seems to be no effective cross-protection with the smallpox vaccine and parapoxviruses in contrast to orthopoxviruses do not mount a long lasting immune response. This leads to relatively low antibody titers only and repeated infections in exposed hosts.

As a reference laboratory for Orthopoxviruses we recently diagnosed a human case of Orf virus (ORFV) in a chamois hunter from North Tyrol. This was done by molecular diagnosis and DNA sequencing, cell cultures, as well as serological diagnostic (IF). As the man re-