Prevalence and Risk Factors for H1N1 and H3N2 Influenza A Virus Infections in Minnesota Turkey Premises

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Important Findings

Influenza subtypes of swine origin have been diagnosed in turkey premises; however, it is not known how common these infections are nor the likely routes of transmission. The researchers conducted a cross-sectional study to estimate the prevalence of influenza and examined factors associated with infection on Minnesota turkey premises. Prevalence of H1N1 and H3N2 influenza viruses was 4.7%. Influenza infection status was associated with proximity to pig premises and flock size. The latter had a sparing effect on influenza status.

Significance of Findings

This study suggests that H1N1 and H3N2 influenza virus infections of turkey premises in Minnesota are an uncommon event. The route of influenza virus transmission could not be determined; however, the findings suggest that airborne transmission should be considered in future studies. Additionally, the significant association of pig farm proximity to turkey premises as a probable risk factor for infection sheds light on important epidemiologic information regarding the interspecies transmission of influenza in the field. More studies are needed to further understand the risks of influenza transmission between these two species and to define practical guidelines to mitigate the risk.

Additional Information

Influenza virus infections of turkeys can be asymptomatic or cause clinical disease depending on the virulence of the strains and presence of co-infections. Clinical signs can range in severity from none to mild to severe and may include ruffled feathers, diarrhea, anorexia, incoordination, opisthotonos, paddling movements, spastic paralysis, somnolence, and death. In 1992, Halvorson et al. reviewed the occurrence of influenza in turkeys raised in the United States, and reported that influenza viruses had been detected in 25 states. Eleven hemagglutinin subtypes (H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, and H13) had been identified up until 1991. Influenza viruses H1 and H9 were detected frequently from 1978 through 1991. Wild birds were considered the most likely source of these viruses.

In Minnesota, influenza infections with several subtypes have been reported in turkeys, especially during the cold months of the year, and all viruses have been classified as low pathogenicity. In September 1978, influenza outbreaks involving three subtypes (H6N1, H4N2, H1N1) occurred in turkey flocks and an egg-producing chicken premises in Minnesota. It was hypothesized that the origin of the H6N1 virus outbreak in the chicken premises was a nearby turkey premises; however, possible origins of the other two subtypes were not identified. In August 1995, an H9N2 influenza outbreak in commercial turkeys was reported in central Minnesota. Interestingly, the virus continued spreading and infected multiple turkey premises until March 1996. Factors such as presence of wild birds on turkey ranges, cross contamination between farms, contaminated trucks, and poor cleaning and disinfection protocols were identified as potential contributors to the epidemic. The cessation of Minnesota range turkey production in 1998 decreased the total number of influenza positive flocks, but the number and percentage of flocks identified with H1N1 and/or H3N2 antibodies increased. With few if any clinical signs in commercial market turkeys, H1N1/H3N2 infections of turkey breeding flocks have become increasingly important to the Minnesota turkey industry. H1N1/H3N2 vaccination of turkey breeders is now routine in an effort to fend off infection from H1N1/H3N2 influenza strains which has led to significant egg production drops in the past.

Other infections of turkeys with swine influenza viruses (i.e., H1N1, H3N2) have also been reported. In 1980, a farm in Ohio housed breeder flocks and 1000 pigs (farrow-to-finish) on the same premises but in separate barns just 12 m apart. Two distinct outbreaks were reported in consecutive years. The first outbreak in turkeys followed an increase in respiratory disease that affected all age groups of pigs following the introduction of recently purchased boars infected with influenza A virus. Immediately, decreased egg production and an increase in culled eggs were noticed in the breeder flock. The second outbreak followed a similar pattern. The introduction of boars with respiratory signs into the pig farm was followed by a respiratory disease outbreak in the growing pigs, and subsequently a drop in egg production from the turkeys was recorded. Laboratory diagnostics confirmed that an identical H1 swine influenza virus had infected both pigs and turkeys, but the mechanism of transmission of the virus from pigs to the turkeys was not elucidated. Subsequently, there have been numerous reports of swine influenza viruses infecting turkey flocks where no pigs were kept at the same premises.

With approximately 600 turkey premises, Minnesota is the leading turkey-producing state in the United States, and it is also the third largest swine-producing state. In certain areas of the state, production of both turkeys and pigs occurs in close proximity. Estimates of the economic impact of influenza in turkeys in the United States have ranged from US$200,000 up to US$5 million dollars during influenza outbreaks between 1978 and 1991. In the same report, authors estimated a loss of US$0.50 to $2 per turkey marketed. It is estimated that economic losses to Minnesota turkey growers due to the 1995 H9N2 influenza outbreak were US$6.2 million, with 87% of the losses attributable to mortalities, condemnation, and depopulation.

Due to the potential for interspecies transmission of influenza viruses and the presence of co-localized premises of turkeys and pigs in agricultural regions such as Minnesota, understanding the disease ecology of virus infections is key for control. Additionally, epidemiologic information on the prevalence and risk factors for interspecies transmission between pigs and turkeys is scarce. Therefore, the objectives of this study were to estimate the prevalence of H1N1 and H3N2 influenza virus infections in turkey flocks in Minnesota and examine some factors that may be associated with infection.