

Occupational exposure to new influenza virus that infects cows

Influenza D virus (IDV) was first identified in 2013, and since been found in cattle and swine with influenza-like illness in multiple countries. It is closely related to influenza C virus but cannot exchange genes with influenza C to produce novel infectious virus particles. And antibodies against influenza A, B and C viruses do not inactivate IDV; thus, IDV is considered a “new” type of influenza virus. Animal studies that are used to test the virulence of human influenza viruses show IDV replicates in the upper and lower respiratory tracts, and is capable of being transmitted to close contacts. These findings suggest the virus can infect and replicate in humans, and be transmitted person-to-person. Field studies have focused on anti-IDV antibody detection in cattle and swine as evidence of past infection by the virus; however, newer evidence suggests IDV also affects sheep and goats. While no active human cases of IDV infection have been identified to-date, about 1.3% of the general population has antibodies to IDV. Since cattle are the suggested primary reservoir of IDV, one can hypothesize that contact with cattle increases the risk of exposure to IDV, resulting in development of IDV-specific antibodies. Here we look at the presence of IDV antibodies in a cohort of cattle-workers in north-central Florida using two antibody-based tests.

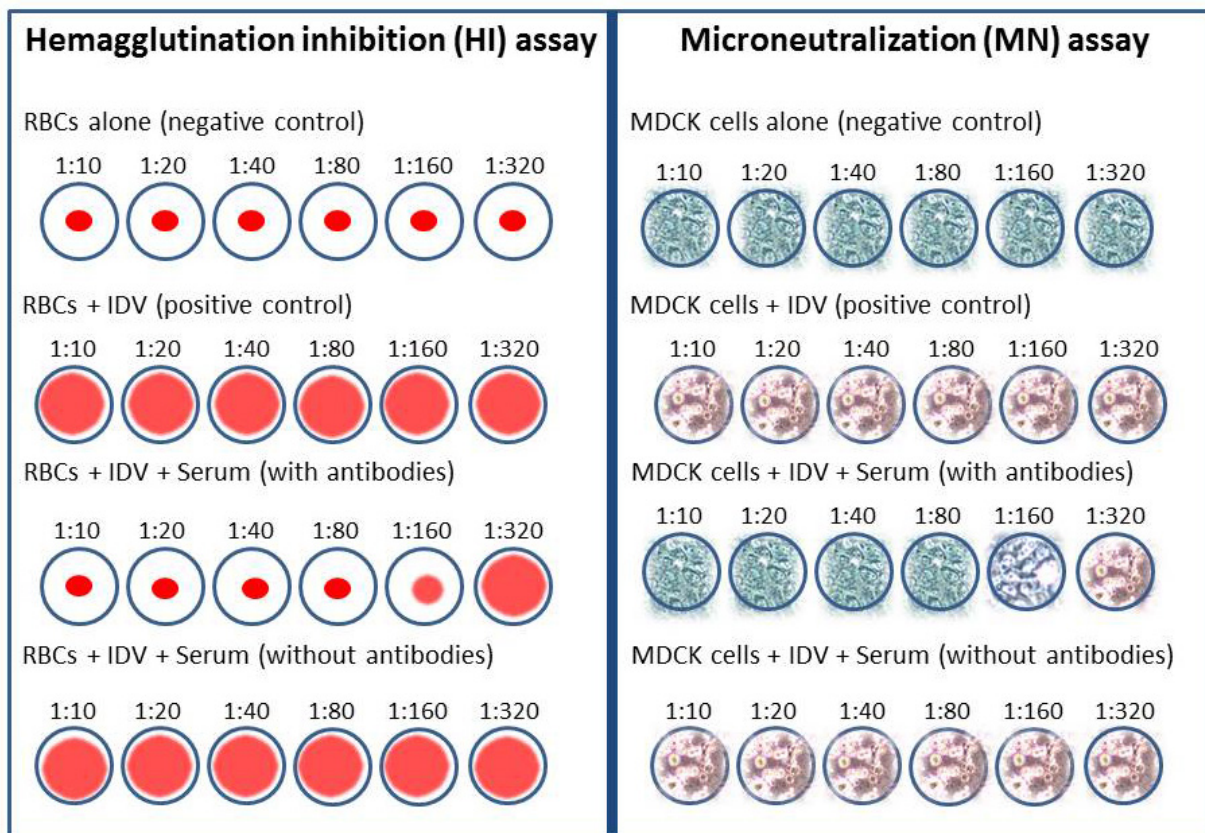


Fig. 1. Depiction of Hemagglutination inhibition and microneutralization assays as performed in

96-well plates with serum samples.

Our study involved 35 cattle-workers and 11 non-cattle-exposed adults from north-central Florida. A whole-blood sample and questionnaire information were collected from all 46 participants following informed consent. Questionnaire information included demographics, medical history, and animal and occupational exposure.

Hemagglutination inhibition (HI) and Microneutralization (MN) assays are two common methods used to measure the amount of anti-influenza virus antibodies in a given volume of serum, and were used to evaluate whether the participants had antibodies to IDV (Fig. 1).

The HI assay required turkey red blood cells (RBCs), IDV, and participant serum. IDV cause turkey RBCs to clump together, but cannot do so when they are covered with anti-IDV antibodies. The MN assay required MDCK cell cultures, IDV, and serum. IDV kills MDCK cells, but cannot do so when they are covered with anti-IDV antibodies. For both HI and MN assay an inverse correlation exists: the higher the amount of antibody, the lower the extent of RBC clumping, or the lower the number of MDCK cells killed, respectively. Both assays are performed using serial dilutions of sera; a positive reaction at a serum dilution 1:40 is considered significant.

Demographics were similar among cattle-workers and non-cattle-exposed participants. Positive HI results were detected in 32 (91%) cattle-exposed sera and 3 out of 4 tested non-cattle-exposed sera. Due to limited resources and sera, only 39 of 46 samples could be tested by both assays (35 cattle-exposed and 4 non-cattle-exposed). All 46 samples were tested by MN assay; 34 (97%) sera from cattle-exposed (maximum titer 1:320) and two (18%) non-cattle-exposed persons were positive. One non-cattle-exposed individual with an MN titer of 1:80 reported non-occupational contact with swine, and contact with cattle >10 years prior to serum draw. Overall, 94% of the cattle-exposed persons had positive HI and MN titers.

This is the first IDV antibody study to look at an occupation which may be at higher risk of IDV exposure. The 18% seroprevalence among our 11 non-cattle-exposed individuals detected by MN is likely attributed to a small sample size, compared to 1.3% seroprevalence among the general population. The questionnaire did not include goat and sheep exposure, which could attribute to IDV antibody detection if these animals are able to be infected and transmit IDV. Results indicate that cattle-exposed individuals may have been infected with IDV through occupational zoonotic transmission.

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Publication

[Serologic evidence of exposure to influenza D virus among persons with occupational contact with cattle.](#)

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