

LETTERS

■ ■ INFLUENZA

Influenza A (H1N1) infection in pigs

We wish to report the preliminary findings of an experimental study in pigs infected with a strain of the recently emerged influenza A (H1N1) virus associated with the current global epidemic in humans (Irvine and Brown 2009). The study is funded by the European Commission (DG SANCO) and Defra, and comprises a project consortium of nine institutes and organisations from eight EU member states, coordinated by the Mammalian Influenza Group, Veterinary Laboratories Agency (VLA) – Weybridge. The study aims include investigation of the infection dynamics, clinical outcome, pathogenesis, host susceptibility, immune response and transmissibility of influenza A (H1N1) virus infection in pigs.

The study design has involved six groups of pigs, aged four to five weeks at the start of the experiment, using an established infection and transmission model. One group of pigs (group A) (n=11) was infected (on

May 15, 2009) by intranasal aerosol. Three uninfected pigs were maintained as a control group, and four pairs of naive, uninfected pigs were sequentially introduced with previously infected pigs for contact transmission at monitored intervals.

All of the pigs were subject to daily veterinary inspections, temperature and bodyweight measurements, and the collection of nasal, ocular, oral and rectal swab samples. Swab samples were then subject to testing by real-time RT-PCR methods. Blood samples were also collected daily from the infected pigs up to day 4 postinfection, and again at day 7, for assessment of viraemia, acute phase protein production and other haematological and immunological parameters. Blood sampling for serology and haematology was then performed twice weekly. Postmortem examinations were performed on two pigs from group A on day 1 (one pig only), and days 2, 3, 4 and 7 postinfection. A full range of tissue specimens was collected.

Results of our preliminary analyses of the clinical, pathological, shedding and transmission data from the first 14 days of the study have shown that pigs are susceptible to infection with influenza A (H1N1) virus,

which results in the induction of detectable levels of clinical disease, virus shedding and respiratory tract pathology in an experimental setting. Furthermore, while variations in the range, pattern and severity of clinical signs and morbidity were observed between individuals and infected groups, these remained typical of influenza A infections in pigs.

Importantly, mortality was not a feature, and infected animals were able to transmit the virus to naive contact pigs successively for at least three cycles of transmission, suggesting the virus could become established in susceptible pig populations if introduced, with consequent impacts. To date, reverse zoonosis has been reported to have occurred naturally on one occasion in Canada (OIE 2009), and we have now demonstrated the potential for this phenomenon experimentally. It is also important to note that the observed levels of morbidity and mortality in a field setting may differ depending on a number of factors, including the age of the pig, immune status to endemic swine influenza viruses and, in particular, the role of other intercurrent disease and/or pig husbandry and management factors that could result in differing clinical and economic impacts to the pig industry.

A key aim of this study is the timely provision and dissemination of critical data relating to the outcomes of infection with this novel influenza A H1N1 virus in pigs to interested parties, including veterinary surgeons, industry and other stakeholders, and to also provide a robust scientific evidence base to inform veterinary and public health risk assessments and decision makers. Further information and details relating to these preliminary analyses can be found on the VLA website: www.defra.gov.uk/vla/diseases/dis_si.htm

In addition, over the coming weeks and months further work and analyses relating to this study are planned, and will be conducted by all members of this EU study consortium. Updates will continue to be provided through a variety of media, including websites (European Commission, DG SANCO [http://ec.europa.eu/food/committees/regulatory/scfcah/animal_health/index_en.htm], VLA, Defra), and peer-reviewed and other publications.

Sharon M. Brookes, Richard M. Irvine, Alejandro Nunez, Derek Clifford, Steve Essen, Ian H. Brown, *Community Reference Laboratory for Avian Influenza and Newcastle Disease, VLA – Weybridge, New Haw, Addlestone, Surrey KT15 3NB*

Kristien Van Reeth, *University of Ghent, Salisburylaan 133, 9820 Merelbeke, Belgium*

Gaëlle Kuntz-Simon, *Agence Française de Sécurité Sanitaire des Aliments, LERAPP, Zoopôle Les Croix, BP 53, 22440 Ploufragan, France*

Willie Loeffen, *Central Veterinary Institute, Lelystad, PO Box 65 8200 AB Lelystad, The Netherlands*

Emanuela Foni, *Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna, Sezione di Parma, Via dei Mercati 13 A, 43100 Parma, Italy*

Lars Larsen, *National Veterinary Institute, Technical University of Denmark, Bülowsvej 27, Building 11, Room 1.118, 1790 København V, Denmark*

Mikhail Matrosovich, *Institute of Virology, Philipps University, Hans-Meerwein-Strasse 2, 35043 Marburg, Germany*

Michel Bublot, *Merial, 29 Avenue Tony Garnier, 69007 Lyon, France*

Jaime Maldonado, *Laboratorios HIPRA, Avda. La Selva, 135, 17170 Amer Girona, Spain*

Martin Beer, *Friedrich-Loeffler-Institute, Federal Research Institute for Animal Health, Südufer 10, 17493 Greifswald-Insel Riems, Germany*

Giovanni Cattoli, *Istituto Zooprofilattico Sperimentale Padova, Viale dell'Università 10, 35020 Legnaro, Padova, Italy*

References

- IRVINE, R. M. & BROWN, I. H. (2009) Novel H1N1 influenza in people – worldwide spread from an animal source? *Veterinary Record* **164**, 577-578
- OIE (2009) World Organisation for Animal Health, WAHID Weekly Disease Information. Vol 22, number 19, May 7, 2009. www.oie.int/wahis/public.php?page=weekly_report_index&admin=0. Accessed May 28, 2009