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DES ALIMENTS

Maisons-Alfort, 20 October 2009

Opinion

of the French Food Safety Agency regarding the risk of contamination of pork and pork products by the 2009 A (H1N1) influenza virus

DIRECTOR-GENERAL

Review of the request:

On 13 August 2009, the Directorate General for Food (DGAL) and the Directorate General for Health (DGS) submitted a joint request to the French Food Safety Agency (AFSSA), for an assessment of various measures to be implemented in pig farming with respect to the human influenza 2009 epidemic caused by the A (H1N1) virus, as well as the related hazard due to consumption of pork and pork products from infected pigs.

This Opinion deals with questions about the possible contamination of pork and pork products by the 2009 A (H1N1) influenza virus.

Report by the ‘Swine Influenza’ emergency collective expert assessment group

The available members of the ‘Swine Influenza’ Emergency collective assessment group (GECU ‘IP’), appointed on 22 May 2009, and two members of the ‘Microbiology’ Scientific panel, met at AFSSA and communicated by e-mail on 24 September 2009 to review the following points:

Background

- *According to the World Health Organisation^{1,2}, “Swine influenza A (H1N1) has not been shown to be transmissible to people eating properly handled and prepared pork or other products derived from pigs. The 2009 A (H1N1) influenza virus is killed at cooking temperatures [measured at the core] of 160°F/70°C, corresponding to the general recommendations for the preparation of pork and other meat”.*
- *Several sources have reported gastrointestinal symptoms in people infected with 2009 A (H1N1) influenza virus^{3,4,5,6} (Shinde et al., 2009 ; Novel Swine-origin Influenza A (H1N1) Virus Investigation Team, 2009 ; Belshe R.B., 2009). Furthermore, a study showed viral RNA and infectious virus in the faeces of ferrets experimentally infected with this virus (Maines et al., 2009).*

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¹ <http://www.who.int/wer/2009/wer8418.pdf>

² http://www.pandemic.knet.ca/files/swine_flu_faq_0.pdf

³ <http://www.cdc.gov/H1N1flu/qa.htm>

⁴ <http://www.flu.gov/individualfamily/about/h1n1/index.html>

⁵ <http://www.aboutflu.net/swine-flu-symptoms.htm#>

⁶ <http://www.reuters.com/article/domesticNews/idUSTRE5975YC20091008>

- *Brookes et al. (Submitted for publication) detected viral RNA ad hoc in the supernatants from rectal swabs in 2 out of a total of 11 infected pigs. The absence of digestive tract lesions led them to believe that the virus had not multiplied in this tract.*
- *In its Opinion no. 2009-SA-0126 regarding zoonotic risk associated with the H1N1 A/California/04/2009 virus in the context of French livestock production, as of 15 May 2009, AFSSA noted that no risk of human contamination through food need be feared as a result of consuming pork.*
- *Furthermore, AFSSA, in Opinion no. 2009-SA-0230 regarding risks posed by the 2009 A (H1N1) influenza virus to humans, the objectives of surveillance and control of pig populations under the community guidelines vis-à-vis this virus, and specific biosecurity measures for pig production, stated that human contamination by this virus from pigs occurs via the respiratory route (by nasal discharge and aerosol emission from infected animals).*

Questions asked

In order to determine the best possible risk management measures for the consumption of pork and pork products from pigs which might be infected with 2009 A (H1N1) influenza virus, the DGAL would like AFSSA's opinion about:

- *"The routes of transmission of the virus in the tissue of a contaminated live pig (localisation, time elapsed after initial contamination, duration, etc.)";*
- *"Routes of viral shedding (time elapsed after initial contamination, duration, etc.)";*
- *"The available methods for detecting 2009 A (H1N1) influenza virus, depending on the nature of the matrix (muscle, liver, dry, raw or cooked final product) and their conditions of use (routine, other, etc.)";*
- *Therefore, the risk of human contamination resulting from:*
 - *"Handling infected tissue from carcasses in slaughterhouses, and rendering and processing facilities? More specifically, can dehydration [of meat] due to sweating, air, and UV rays affect the survival of the virus in infected tissues both for surface and deep tissue contamination? "*
 - *"Consumption of contaminated pork and pork products? If there is a risk and if it is significant,*
 - *would drying these products be likely to reduce the consumer health risk, and if so, what drying protocol should be recommended? What degree of dehydration (a_w [water activity]) ensures disinfection?*
 - *Would treatment by prior cooking of products that are meant to be cooked be likely to reduce the consumer health risk? If so, what cooking protocol (time/temperature pair according to cooking method: oven, stove, etc.) should be recommended?*
 - *What are the permissible concentrations of salt for curing the products? "*
- *The following questions have also been raised:*
 - *"Which safety measures should be recommended for the staff of slaughterhouses, and rendering and processing facilities, if any?";*
 - *"Is contact by equipment or facilities with the meat of pigs infected with the 2009 A (H1N1) influenza virus likely to pose a consumer health risk? If so, what are the procedures for effective cleaning and disinfecting?";*
 - *"Does the cross-contamination of other foodstuffs by contaminated pork and from equipment coming into contact with contaminated meat pose a consumer health risk? "*

Assessment Method

Following the meeting with AFSSA and by telephone on 24 September 2009, the Scientific panel on animal health prepared a draft opinion that was discussed by the members of GECU 'IP' and by two members of the 'Microbiology' Scientific panel (CES) by e-mail-, and approved on 13 October 2009.

The assessment was based on:

- Documents provided by the applicant:
 - Letter of request dated 13 August 2009;
 - Annexe "Influenza A H1N1 – biosecurity measures in pig farming";
 - "Working document on surveillance and control measures for the pandemic (H1N1) 2009 influenza virus in pigs" prepared by the European Commission;
- AFSSA Opinion no. 2009-SA-0230 on the risks posed by the 2009 A (H1N1) influenza virus to humans, on surveillance and control measures in pig populations under the community guidelines vis-à-vis this virus, and on specific biosecurity measures for pig farming, dated 30 September 2009;
- DEFRA report presenting preliminary results as of 29 May 2009 from experimental studies of pig infection with influenza A (H1N1) virus. The report is available at the following URL:
http://www.defra.gov.uk/vla/diseases/docs/dis_si_study.pdf;
- Miscellaneous scientific papers listed in the annexe "Main Bibliography";
- Discussions between the GECU 'IP' experts and the two experts from the 'Microbiology' Scientific panel.

Discussion and recommendations

As indicated in AFSSA Opinion no. 2009-SA-0230 of 30 September 2009 regarding risks posed by the 2009 A (H1N1) influenza virus to humans, on surveillance and control measures in pig populations under the Commission guidelines published for this virus, and on specific biosecurity measures for pig farming, the swine influenza virus (SIV) produces only localised infection in the respiratory tract, with viral multiplication limited to the epithelial cells of the nasal mucosa, tonsils, trachea, bronchi, lungs and tracheobronchial lymph nodes (Brown et al., 1993; Heinen et al., 2000; Lanza et al., 1992; Olsen et al., 2006). Thus far, the presence of the virus in tissues outside the respiratory system has not been demonstrated, including during experimental infections (Choi et al., 2004).

The results from two experimental studies of pig infection with influenza A (H1N1) virus in Europe have shown that this virus, like other SIV's, is found in oronasal and ocular secretions (Brookes et al., submitted for publication ; Lange et al., 2009).

To date, no evidence has been found of infectious viruses in the faeces of infected pigs. Brookes et al. (submitted for publication) detected viral RNA ad hoc in the supernatants from rectal swabs of two out of a total of eleven infected animals. The lack of digestive tract lesions suggests that the virus does not multiply in the intestinal epithelium. Lange et al. (2009) reported diarrhoea in several infected and contact pigs, but they attributed it to the deterioration of the general condition of the infected animals and not to digestive tract viral tropism.

1/ "Routes of transmission of the virus in the tissues of a contaminated live pig (localisation, time elapsed after initial contamination, duration, etc.)":

Recent studies (Brookes et al., 2009; Brookes et al., submitted for publication; Lange et al., 2009, DEFRA report referred to in 'Assessment Method' section) about the

transmission of the 2009 A (H1N1) influenza virus in pigs and the pathogenesis of the infection have shown that they are similar to that reported in the literature concerning the infection of pigs by most SIV's:

- the route of contamination in pigs is oronasal;
- the infection is limited to the respiratory tract (upper and lower); and associated lymphoid tissue; no viraemia was found in pigs infected with the 2009 A (H1N1) influenza virus ;
- the slightly perceptible symptoms (hyperthermia of more than 39.5°C, nasal discharge, barking cough, lethargy, inappetence [going off feed]), usually appear about 3 to 5 days after infection and last around 7 days. The infection of specific-pathogen-free (SPF) miniature pigs by Itoh et al. (2009) with the 2009 A (H1N1) influenza virus has also remained asymptomatic.

2/ "Routes of viral shedding (time elapsed after initial contamination, duration, etc.)":

In addition, these experimental studies showed that:

- the virus is found in oronasal and ocular secretions (Brookes et al., submitted for publication; Lange et al., 2009);
- virus shedding begins 24 to 48 hours after infection, i.e. before the onset of symptoms in infected animals;
- it lasts up to 10 to 15 days after infection.

3/ "Available methods for detecting 2009 A (H1N1) influenza virus, depending on the nature of the matrix (muscle, liver, dry, raw or cooked final product) and their conditions of use (routine, other, etc.)":

- Real-time RT-PCR (and/or viral isolation) on nasal swabs taken from pigs in the clinical phase for viral diagnosis of the SIV in livestock.
- Due to the distribution of the SIV in the body of the infected pig, which is limited exclusively to the respiratory area, and the absence of viraemia during infection of the animals, the application and routine use of RT-PCR for detecting viral RNA is not justified on other matrix systems (muscles, liver, etc.).

4/ "Risks of contamination in humans handling infected tissues of carcasses in slaughterhouses, and rendering and processing facilities? More specifically, can dehydration [of meat] due to sweating, air, and UV rays affect the survival of the virus in infected tissues both for surface and deep tissue contamination? "

- Given the data on the distribution of SIV in the bodies of infected pigs, described above, the GECU 'IP' considers that the risk of contamination for humans following the handling of the carcass (eviscerated) of an infected animal is "zero" (level 0 on a scale of 0 to 9).
- Even though the law prohibits slaughtering of animals showing symptoms of illness and removes them from slaughterhouses, the presence of pulmonary lesions in pigs that may be asymptotically infected by the 2009 A (H1N1) influenza virus remains a possibility. The respiratory tract of these animals, and therefore the pluck, can still contain viral particles.

At the slaughterhouse, the plucks of slaughtered pigs are quickly separated from the carcass and designated for specific treatment, separate from the other tissues from the animal.

The slaughterhouse staff is not exposed to infection by respiratory route from the nasal discharge of animals. The risk for these people lies in hand transmission of the virus, from direct contact with infected respiratory tissue from their hands to their own oronasal mucosa. However, the GECU considers that the conventional rules of hygiene applied in slaughterhouses (wearing disposable gloves when handling

animal tissue, more frequent changing of these gloves) reduces the probability of exposure of slaughterhouse staff to the 2009 A (H1N1) influenza virus by direct hand contact to “almost zero” (level 1 on a scale of 0 to 9).

5/ “Risks of contamination in humans consuming contaminated pork meat and products”

Given the information discussed above concerning the localisation of the virus in the body of pigs infected by the 2009 A (H1N1) influenza virus, the risk of contamination in humans through consumption of meat and products derived from an infected pig is considered to be “zero”.

6/ “What personal protective measures should be recommended for the staff of slaughterhouses, and rendering and processing facilities, if any?”

- Staff in the receiving pens for pigs awaiting slaughter: Given the epidemiology of the influenza A (H1N1) virus in French pig farms, and according to Opinion no. 2009-SA-0230 regarding risks posed by the 2009 A (H1N1) influenza virus for humans, on surveillance and control measures in pig populations under the Commission guidelines for this virus, and on specific biosecurity measures for pig farming dated 30 September 2009, the probability of contamination of this staff can be described as follows:

- As of 15 October 2009, the probability of pigs in France being infected with the 2009 A (H1N1) influenza virus is “very low” (level four on a scale of 0 to 9);
- The probability of an infected pig that shows clinical signs and sheds the virus by respiratory route reaching the slaughterhouse may be considered “very low” (level 4 on a scale of 0 to 9);
- The probability of contamination staff working in receiving pens by pigs that might be shedding the virus may be considered “high” (level 8 on a scale of 0 to 9).

After cross-matching these different levels of probability (AFSSA, 2008), the GECU on ‘Swine Influenza’ considers the risk of contamination in receiving pen staff as “minimal” (level 2 on a scale of 0 to 9).

Slaughterhouse staff: the main risk identified in item 4 of this Opinion lies in hand contamination following contact with the tissue of the respiratory tract of infected pigs.

- The GECU IP considers that **the application of general hygiene measures in slaughterhouses is likely to protect staff.**

Furthermore, the advisability of vaccinating slaughterhouse staff working in pig receiving pens is considered in AFSSA Opinion no. 2009-SA-0230.

7/ “Is contact by equipment or facilities with the meat of pigs infected with the 2009 A (H1N1) influenza virus likely to pose a consumer health risk? If so, what are the procedures for effective cleaning and disinfection?”

As previously indicated, with respect to **meat** from infected pigs showing no infectivity, the risk of secondary contamination of equipment and facilities coming into contact with it is “zero”.

8/ “Does the cross-contamination of other foodstuffs by contaminated pork and from equipment coming into contact with contaminated meat pose a consumer health risk?”

The aspects discussed in item 7 for equipment also apply to **foods that come into contact with pork or pork products:** the risk for these foods is considered “zero”.

Consequently, the risk to the consumer is also “zero”.

These are AFSSA's conclusions following its assessment of the possible contamination of pork and pork products by the 2009 A (H1N1) influenza virus.

The Director-General of the French
Food Safety Agency

Marc MORTUREUX

Key words: influenza, pigs, 2009 A (H1N1) influenza virus, SIV, pathogenesis, protection, slaughterhouses, staff, foodstuffs”

ANNEXE
Main Bibliography

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