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EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

Editorials

To baptise a virus and its disease

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The currently circulating new novel Mexican North American Californian swine-like influenza A(H1N1) virus of swine origin has been named and renamed more than once since its recognition a month ago [1]. It is time to agree on names for the virus, and for the disease it causes.

When it comes to individual isolates, the issue seems to be straightforward. According to established convention, an A(H1N1) isolate obtained from a patient in California in 2009 could be called influenza A/California/4/2009(H1N1)swl. This name indicates the species (influenza virus), the type (A) and the subtype (H1N1), and details the origin of the isolate in question, in the case of our example, an isolate with laboratory number 4, obtained from a patient in California in 2009. The abbreviation swl, for swine influenza-like, also referred to as swine lineage, is added to the name to indicate that parts of this virus are genetically related to influenza A(H1N1) viruses circulating in pigs [2].

When it comes to a more general naming of the virus and the disease it causes, however, a consensus is harder to reach. The virus and disease have been called "swine flu", a name that worried the pig faming industry, and "Mexican flu", a name that threatened the Mexican tourism industry and "new" or "novel influenza A(H1N1)", a name not chosen to last. Most simply, but unspecifically it is called, "influenza A(H1N1)" which is what currently appears on WHO's website.

The name of the virus will have to become more specific quite quickly as there are already the circulating A(H1N1) seasonal viruses which are quite different from the new virus [3]. With the Southern Hemisphere influenza season nearly upon us there will be two "A(H1N1)" viruses co-circulating. Different names will be essential in this respect.

Among the later suggestions for the name of the virus are "influenza A(H1N1)swl" and "A(H1N1)-SL" – both stand for swine-like, as well as "A(H1N1)-SOIV" – for swine origin influenza virus and "A(H1N1)-SO" – swine origin [2,4]. On balance the term SL or swl seems more neutral and simply descriptive. It might be debatable how appropriate the denomination "swine-like" is, as the virus also contains genes from human and bird as well as from swine influenza viruses. However, this denomination is already widely used in the isolate names [2].

Also the question how to call the disease this virus causes is not an easy one. The term "swine flu" has been used so extensively in the media that it will be difficult to get rid of it. Swine flu however, is not desirable, neither medically or scientifically as this is now a human influenza, transmitting efficiently from one person to another. The vast majority of those infected will receive it from other humans not from pigs. Even if the disease pattern currently mirrors seasonal influenza simply calling it "influenza" is also not optimal, as there are emerging indications that are distinct. Furthermore, there are implications that health professionals and the general public need to understand, when a human is infected with new influenza A(H1N1) rather than the seasonal influenza A(H1N1) [5-7]. Even if the virus fits the three criteria of a pandemic strain: infecting humans, making them ill and transmitting efficiently from human to human, a pandemic remains yet to be declared so we cannot call it 2009 pandemic influenza.

References

1. United States Centers for Disease Control and Prevention (CDC). Swine influenza A (H1N1) infection in two children--Southern California, March-April 2009. MMWR Morb Mortal Wkly Rep. 2009;58(15):400-2. Available from: www.cdc.gov/mmwr/preview/mmwrhtml/mm5815a5.htm
2. Garten RJ, Davis CD, Russell CA, Shu B, Lindstrom S, Balish A et al. Antigenic and Genetic Characteristics of Swine-Origin 2009 A(H1N1) Influenza Viruses Circulating in Humans. Science Express. Published Online May 22, 2009. Science DOI: 10.1126/science.1176225. Available from: www.sciencemag.org/cgi/content/abstract/1176225v1
3. European Centre for Disease Prevention and Control. Seasonal influenza European Status. Available from: http://ecdc.europa.eu/en/health_content/episu/090522_EISS.aspx
4. Novel Swine-Origin Influenza A (H1N1) Virus Investigation Team. Emergence of a Novel Swine-Origin Influenza A (H1N1) Virus in Humans. N Engl J Med. Published online on May 7, 2009, and updated on May 22, 2009. N Engl J Med 2009;360. 10.1056/NEJMoa0903810. Available from: http://content.nejm.org/cgi/content/full/NEJMoa0903810?resourcetype=HWCIT
5. United States Centers for Disease Control and Prevention (CDC). Novel Influenza A (H1N1) Virus Infections -Worldwide, May 6, 2009. MMWR Morb Mortal Wkly Rep. 2009;58(17):453-8. Available from: www.cdc.gov/mmwr/preview/mmwrhtml/mm5817a1.htm
6. United States Centers for Disease Control and Prevention (CDC). Hospitalized Patients with Novel Influenza A (H1N1) Virus Infection - California, April--May, 2009. MMWR Morb Mortal Wkly Rep. 2009;58(19):536-41. Available from: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5819a6.htm
7. European Centre for Disease Prevention and Control. Scientific Advances Influenza A(H1N1). Available from: www.ecdc.europa.eu/en/health_content/sciadv/090524_sciadv.aspx

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Cluster of new influenza A(H1N1) cases in travellers returning from Scotland to Greece – community transmission within the European Union?

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On 26 and 27 May, the Hellenic Centre for Disease Control and Prevention in Greece reported two confirmed cases of new influenza A(H1N1) virus infection in travellers returning from Scotland. The two cases had no apparent traceable links to an infectious source. Herein we report details of the two cases and potential public health implications.

Case report

Case 1

A 21-year old Greek man developed mild influenza-like illness on 24 May while in Edinburgh where he studies. Symptoms included cough and fever (39ºC). On 25 May, he travelled to Athens in Greece and the next day, 26 May, he visited the outpatient department of one of the hospitals designated for influenza A(H1N1) in Athens. The examining physician decided to take a pharyngeal swab, which was tested at the National Influenza Reference Laboratory for Southern Greece, although the patient did not meet the European Union (EU) and national criteria for the new influenza A(H1N1) testing ("case under investigation") [1]. The result of real time PCR was positive for the new influenza A(H1N1) virus (CDC kit). The patient reported no travel history to another place in the past 15 days. To his knowledge, he had no contact with a known case of influenza A(H1N1) or any sick person. However, on 21 May, he met a large number of people, mainly students and attended three student parties in the evenings of 21, 22 and 23 May. Furthermore, he spent a lot of time with his two room-mates and at least two other close friends, one of whom is case 2. The patient has not developed any complications and is in good condition.

Case 2

A 20-year old Greek man, a close friend and fellow student of case 1, developed mild influenza symptoms without complications, with fever (38ºC), mild cough and myalgia, on 24 May. He travelled from Edinburgh to Thessaloniki in Greece on the previous day, 23 May. On 26 May he visited the AHEPA hospital in Thessaloniki, after he had learnt about his friend's (case 1) illness. A pharyngeal swab was taken and tested at the National Influenza Reference Laboratory for Northern Greece, and the real time-PCR test was positive for the new influenza A(H1N1) virus (CDC kit). This patient had also attended many of the same social events as case 1, including the party of 21 May, but he had not participated in the parties on 22 and 23 May. The last time he met his friend (case 1) was in the morning of 23 May, when he was leaving Edinburgh.

Contact tracing was carried out for close family members, room-mates, close friends and social contacts of both the confirmed cases, as well as for flight contacts of case 1, who was symptomatic during his airway travel. Chemoprophylaxis (oseltamivir) was administered to close contacts in Greece according to the national guidelines. All known contact details were communicated to Health Protection Scotland.

Discussion

Cases of human infection with influenza A(H1N1) are currently affecting geographically diverse areas around the world [2-4]. Person-to-person transmission has led to increasing numbers of cases in North America that are attributed mainly to local clusters especially in schools [3]. Nevertheless it appears that in areas with high population density sustained transmission within the community has occurred, mainly in Mexico and the United States, to date [2-3, 5]. So far, no sustained community transmission has been reported in Europe. However the situation is characterised as rapidly evolving [6] and similar clusters have been reported in Europe [7].

We herein report two cases of influenza A(H1N1) who most probably were not infected from one another, as their symptoms started almost simultaneously and their last person-to-person contact took place about 30 hours before symptom onset. It is

likely they had a common exposure during one of their several community gatherings in Scotland with no traceable (at this point) link to the source of infection.

The two Greek cases of new influenza A(H1N1) who acquired infection in Scotland raise two possibilities. It is possible that a seeding event from an as yet unidentified traveller from an affected area with widespread sustained transmission (e.g. United States or Mexico) occurred. Whether this exposure happened during one of the gathering events both cases attended or in the community (since both cases had extensive and wide exposure to other community events) is unclear at this point. Secondly, there is a chance that institution-wide transmission has been taking place in the university the cases attend or widespread transmission exists in the community in the specific geographical area in Scotland that has led to the exposure of the two cases.

Several public health implications arise from the cases presented here. Firstly, cases of the new influenza A(H1N1) infection are for the first time confirmed in travellers from one European country to another, with no specific history of exposure to a traveller from Mexico or the United States and no traceable link to the source of infection. Although sustained human-to-human transmission within the country has not been confirmed in Scotland, a number of cases infected within the country have been reported from the United Kingdom [8].

Secondly, if measures for containment of the new virus continue to be implemented for some time in some of the less affected countries to delay spread, there is a need for an efficient mechanism – at an international or at least European level – for updating information about areas with "sustained community transmission".

Thirdly, at this stage of the new influenza A(H1N1) epidemic, community transmission can be established in any country without a known and well identified chain of transmission. This risk increases as we are entering the tourist season and as the number of countries reporting large numbers of confirmed cases is increasing. It is of concern that with the present EU definition of "cases under investigation" [1], and with the practice this definition implies of testing for A(H1N1) of people with clinical symptoms and travel history to an "affected area" (epidemiological link to a confirmed case or laboratory worker are exceptional at this stage in Europe), we are by definition going to miss cases infected locally in the event of established community transmission without known and identified chain(s) of transmission. For the present period (late spring-summer, minimal seasonal influenza activity), it is probably necessary to modify the present EU definition of "cases under investigation" to also include clusters of patients with influenza-like illness, irrespective of travel history. If this were the case, our patients would have met the criteria for specific influenza A(H1N1) testing.

References

1. Commission Decision of 30 April 2009 amending Decision 2002/253/EC laying down case definitions for reporting communicable diseases to the Community network under Decision n° 21/19/98/EC. 2009/363/EC. Official Journal L 110/58. 01.05.2009. Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:110:0058:0059:EN:PDF
2. Centers for Disease Control and Prevention (CDC). Outbreak of swine-origin influenza A (H1N1) virus infection - Mexico, March-April 2009. MMWR Morb Mortal Wkly Rep. 2009 May 8;58(17):467-70.
3. Centers for Disease Control and Prevention (CDC). Swine-origin influenza A (H1N1) virus infections in a school - New York City, April 2009. MMWR Morb Mortal Wkly Rep. 2009 May 8;58(17):470-2.
4. Novel swine-origin influenza A(H1N1) virus investigation team. Emergence of a novel swine-origin influenza A(H1N1) virus in humans. N Engl J Med 2009 [Epub ahead of print]
5. Centers for Disease Control and Prevention (CDC). Map: weekly influenza activity estimates, including novel H1N1 flu. Available from: http://www.cdc.gov/h1n1flu/update.htm
6. European Centre for Disease Prevention and Control. Situation report. Influenza A (H1/N1) infection. 26 May 2009. Available from: http://www.ecdc.europa.eu/en/files/pdf/Health_topics/Situation_Report_090526_1700hrs.pdf
7. Health Protection Agency and Health Protection Scotland new influenza A(H1N1) investigation teams. Epidemiology of new influenza A(H1N1) in the United Kingdom, April – May 2009. Euro Surveill. 2009;14(19):pii=19213. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19213
8. Health Protection Agency. Swine-lineage influenza A(H1N1). UK update. 27 May 2009. Available from: http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1243322117077

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New influenza A(H1N1) virus infections in France, April – May 2009

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Since the emergence of a new influenza A(H1N1) virus in North America and its international spread, an active surveillance of cases of infection due to this virus has been set up in France in order to undertake appropriate measures to slow down the spread of the new virus. This report describes the epidemiological and clinical characteristics of the 16 laboratory confirmed cases diagnosed in France as of 20 May 2009.

Background

Human cases of new influenza A(H1N1) virus infection have been identified recently in many countries [1,2]. After the detection of the first cases in Mexico and in the United States and the spread of infection to further countries, the World Health Organization (WHO) declared the outbreak of a new influenza A(H1N1)swl (swine-like) virus infection to be a "public health emergency of international concern". On 27 April 2009, the first cases were reported in the United Kingdom and in Spain in travellers returning from Mexico [3,4]. In response to the risk of spread of the disease in France, national active surveillance of respiratory illness among recent travellers in the affected areas (see definition below) has been set up. On 1 May 2009, the first cases were identified in France, and on 20 May 2009, the number of confirmed cases in France has reached a total of 16 cases.

Methods

Organisation of the surveillance

The objective of the surveillance is to detect cases of influenza due to the novel virus in travellers coming back from the affected areas in order to implement control measures around each case and contain the indigenous spread of the virus.

A case definition triggering case investigation has been established and widely diffused [5]. A possible case is defined as a person with acute respiratory illness (defined as the occurrence of fever (≥ 38°C) or myalgia or asthenia and at least one respiratory symptom (cough or dyspnea)) and a history of travel in an affected area or a history of a close contact with a confirmed or possible case during the seven days before the onset of symptoms. Taking into account the international situation, the affected areas mentioned in the case definition are updated when needed [5]. On 20 May 2009, Mexico, United States, Canada, Panama, Dominican Republic and Japan were considered as affected areas.

A probable case is defined as a person with a positive PCR for influenza A virus or a possible case with a close contact with a confirmed or probable case. A confirmed case is defined as an individual tested positive for the new influenza A(H1N1) virus with a specific PCR. As long as a possible case is neither confirmed nor discarded, he/she is considered as "currently under investigation".

Protocols for case and contact management and for infection control were developed and distributed by the French Ministry of Health and the French Institute for Public Health Surveillance (Institut de Veille Sanitaire, InVS). Symptomatic persons coming from an affected area are advised to call the local hospital based mobile emergency unit (Centre 15). A medical practitioner assesses the case by phone and if the person meets the case definition for a possible case the Centre 15 calls the InVS, to validate the classification and guide the case management. Detailed information is available on flights coming from affected areas and at international airports and a 24/24 and 7/7 duty service by trained epidemiologists has been set up at InVS to answer calls from the Centre 15 or other health professionals. Hospitalisation of all possible or probable cases is recommended whatever the severity of symptoms. Nasal swabs from such cases have to be sent to one of the 24 laboratories which have been approved by the Ministry of Health to test those specimens for influenza A by PCR under BSL3 conditions. When the specific A(H1N1)swl PCR have been sent to all 24 laboratories, positive results have to be confirmed and further viral identification to be done by one of the two French National Reference Centres (NRC) for influenza viruses.

Curative treatment by neuraminidase inhibitor is recommended for cases, even those classified as possible ones. Prophylactic treatment by neuraminidase inhibitor is recommended for close contacts of probable or confirmed cases only. These close contacts are asked to follow a quarantine at home and to avoid unnecessary contacts with other people. In case of appearance of fever or respiratory signs, they should consult a medical professional immediately.

Case-base epidemiological and virological data are collected through an interactive application (adapted from Voozano®, Epiconcept®) allowing a real time exchange of information between epidemiologists from InVS, from the 15 French Interregional epidemiology units (Cire) located in mainland France, the two Cire located overseas and virologists of the NRCs.

Results

On 1 May 2009, France reported its first two laboratory-confirmed cases of the new influenza A(H1N1) virus infection in travellers returning from Mexico. By 20 May 2009, InVS and Cire had been involved in 1,613 reportings (41 located overseas). Among these, 348 were classified as possible or probable cases and 16 have been laboratory-confirmed for the new influenza A(H1N1) swl.

The rest of the analysis concerns the 16 confirmed cases. All cases acquired the infection abroad: 11 cases had a history of travel to Mexico and five cases travelled to United States: two came back from California and three from New-York (Figure). To date, no secondary case has been identified in France. Five cases were symptomatic before return to France. Among the remaining 11 cases, disease onset occurred up to four days after return (mean and median: 2 days) and these cases reported themselves up to six days after disease onset (mean: 1.5 day, median: 1 day).

Cases were identified in the following regions: Alsace (3), Aquitaine (1), Auvergne (1), Ile-de-France (9) and Languedoc-Roussillon (2). No case has been identified in the French departments of America (French Guiana, Martinique, Guadeloupe) or in Reunion Island located in the Indian ocean.

The cases were reported to InVS by the Centre 15 (10 cases), a hospital (four cases), an individual (one case) and a virological laboratory (one case).

Of the 16 confirmed cases, 10 are male and six are female. Ages range from 18 months to 65 years (mean: 32 years, median: 29 years). The age distribution by age group is as follows: [0-9 years]: one case, [10-19 years]: two cases, [20-29 years]: five cases, [30-39 years]: four cases, [40-49 years]: two cases, [50-59 years]: one case, [60-69 years]: one case.

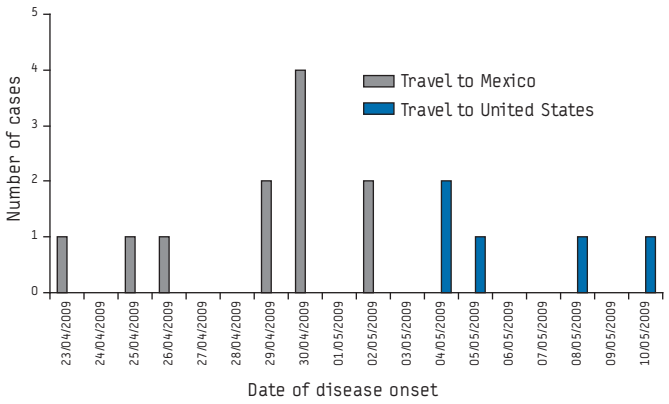
The clinical features of cases show common symptoms for influenza disease (Table).

No complications have been reported and no death occurred. Underlying conditions were reported for four cases: asthma (two cases), physical and mental impairment (one case) and heart disease with dislipemia (one case).

All cases received antiviral curative treatment once diagnosed; 15 patients took oseltamivir alone and one was administered zanamivir and oseltamivir. Fifteen cases were admitted to hospital and the duration of hospitalisation ranged from three to seven days (median: 5 days).

FIGURE

Cases of laboratory-confirmed new influenza A(H1N1) by day of disease onset and travel history, France, as of 20 May 2009



TABLE

Clinical features of confirmed cases of new influenza A(H1N1) virus infection, France, as of 20 May 2009

Symptom	Cases with symptoms / Cases for whom information is available	Percentage
Cough	16*/16	100%
Fever (≥ 38.0°C)	10**/16	62%
Asthenia	9/15	60%
Sore throat	8/14	57%
Myalgia	8/15	53%
Headache	3/15	20%
Sneezing	2/14	14%
Diarrhoea	2/16	13%
Conjunctivitis	2/15	13%
Joint pain	1/14	7%
Vomiting	1/16	6%
Shortness of breath	1/16	6%
Insomnia	1/16	6%

*Cough was reported to be dry for 14 cases (93%) and was associated with a productive cough in three cases.
** Fever was reported to be between 38°C and 39.5°C. Furthermore three more cases reported elevated temperature to 37.5°C (one case) and to 37.7°C (two cases).

Discussion

France, as other European countries, has identified laboratory-confirmed cases of the new influenza A(H1N1) virus infection through an active surveillance set up as a response to the international situation as soon as the alert was given. As reported in other countries, symptoms in laboratory-confirmed cases resemble those of seasonal influenza. To date no secondary case has been identified among close contacts of the confirmed cases. Systematic hospitalisation of cases with strict implementation of control measures may have contributed to this result. Sporadic cases or self limited chains of transmission may have occurred, though, and gone unnoticed despite the measures taken to detect them. This may happen if a sick traveller prefers not to report to a health professional or when the infection passes to close contacts from an asymptomatic traveller. In order to improve the sensitivity of the surveillance system, a complementary modality of surveillance has been implemented. Health professionals have to notify to public health authorities about clusters of at least three cases of respiratory tract infection occurring within one week in a small community (such as a hospital ward, a nursing home, a classroom or a family) without other aetiology identified as well as to report an unexpected increase of such cases among their patients. Virological investigations are required in these cases in order to exclude a possible infection due to the new influenza A(H1N1)swl virus. So far, all such notified events have been discarded as being due to A(H1N1)swl.

To date, no increase in seasonal influenza activity (based on data from general practitioners sentinel networks, on data on

consultations for influenza like illness in a network of hospital emergency units and on mortality data surveillance) has been reported.

*The investigating team is composed of more than 90 members of staff of the Institut de Veille Sanitaire and its regional units (Cellules Interrégionales d'Epidémiologie [CIRE]), and it was constituted to manage the response to the epidemic, to assess suspected cases imported from affected areas and to regularly update international information. We are thankful to laboratories, Centre 15, clinicians, public health authorities, UMR707 INSERM – Université Pierre et Marie Curie, for collecting and kindly providing additional clinical data. The corresponding author is S Vaux, InVS (s.vaux@invs.sante.fr).

References

1. World Health Organization. Influenza A(H1N1). Available from: http://www.who.int/csr/disease/swineflu/en/index.html
2. European Centre for Disease Prevention and Control. Outbreak of influenza A(H1N1). Available from: http://www.ecdc.europa.eu/en/Health_topics/novel_influenza_virus/2009_Outbreak/
3. Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain. New influenza A(H1N1) virus infections in Spain, April-May 2009. Euro Surveill. 2009;14(19):pii=19209. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19209
4. Health Protection Agency and Health Protection Scotland new influenza A(H1N1) investigation teams. Epidemiology of new influenza A(H1N1) in the United Kingdom, April – May 2009. Euro Surveill. 2009;14(19):pii=19213. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19213
5. Institut de Veille Sanitaire. Définition de cas de nouvelle grippe A(H1N1) [Case definition of the new influenza A(H1N1)]. 20 May 2009. Available from: http://www.invs.sante.fr/surveillance/grippe_dossier/definition_cas_h1n1_200509.pdf

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Cluster analysis of the origins of the new influenza A(H1N1) virus

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In March and April 2009, a new strain of influenza A(H1N1) virus has been isolated in Mexico and the United States. Since the initial reports more than 10,000 cases have been reported to the World Health Organization, all around the world. Several hundred isolates have already been sequenced and deposited in public databases. We have studied the genetics of the new strain and identified its closest relatives through a cluster analysis approach. We show that the new virus combines genetic information related to different swine influenza viruses. Segments PB2, PB1, PA, HA, NP and NS are related to swine H1N2 and H3N2 influenza viruses isolated in North America. Segments NA and M are related to swine influenza viruses isolated in Eurasia.

Introduction

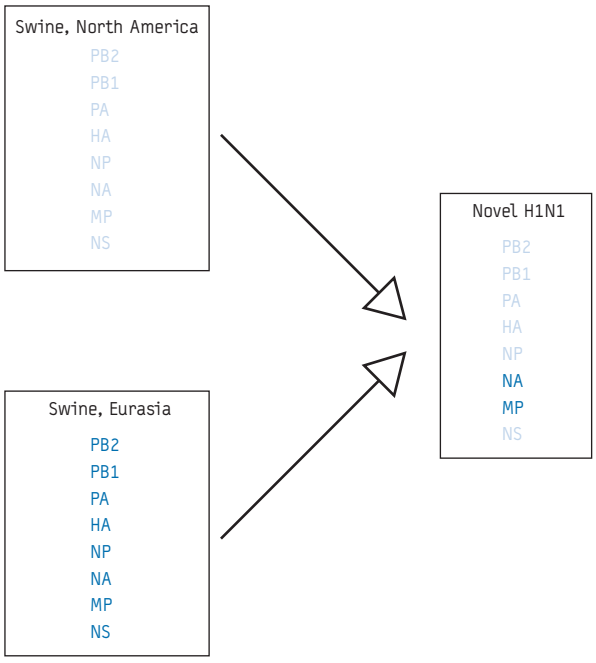
Influenza A virus is a single stranded RNA virus with a segmented genome. When different influenza viruses co-infect the same cell, progeny viruses can be released that contain a novel mix of segments from both parental viruses. Since the first reported pandemic in 1918, there have been two other pandemics in the 20th century. In both cases, the pandemic strains presented a novel reassortment of genome segments derived from human and avian viruses [1-3]. The origins of the 1918 strain are so not clear, although different analyses suggest that this virus had an avian origin [4,5].

When and where pandemic reassortments happen remains a mystery. Avian viruses often undergo reassortment events among different subtypes. Several reports suggest that reassortments are also frequent between human viruses [6,7]. Swine have been found frequently with co-infections and reassortment of swine, human, and avian viruses has been reported [8-10,3]. In addition, cell surface oligosaccharide receptors of the swine trachea present both, a *N*-acetylneuraminic acid-alpha2,3-galactose (NeuAcalpha2,3Gal) linkage, preferred by most avian influenza viruses, and a NeuAcalpha2,6Gal linkage, preferred by human viruses [11]. Co-infection combined with co-habitation of swine and poultry on small family farms all over Asia, and the presence of avian as well as human receptor types in pigs have led to the "mixing vessel" conjecture [12,13] that suggests that most of the inter-host reassortments are produced in pigs.

Recently, a new A(H1N1) subtype strain has been identified initially in Mexico, then rapidly reported in all continents. As of 27 May, 12,954 cases of the new influenza A(H1N1) virus infection, including 92 deaths have been reported to the World Health Organization [14,15]. Several approaches have been used to understand the origins of this strain. Searches in public databases containing influenza A genomes using sequence alignment tools indicated that the closest relatives for each of the eight genomic segments are from viruses circulating in swine for the past decade [16-19]. These include genome segments derived from "triple reassortant" swine viruses that combined in the late 1990s genome

Figure 1

Origins of the new influenza A(H1N1) virus



Schematic representation of the main results of the cluster analysis. The analysis shows that the recent A(H1N1) virus is a reassortment of at least two swine influenza viruses from North America (in light blue) and Eurasia (in dark blue).

segments from viruses previously identified in humans, birds, and swine [20]. Similar conclusions were drawn by the application of phylogenetic techniques [16,21].

Here we present a cluster analysis using Principal Component Analysis and unsupervised clustering. Clustering methods are particularly robust under changes in the underlying evolutionary models. Our results substantiate previous reports [16,21], and demonstrate that for each of the genome segments of the new influenza A(H1N1) virus the closest relative was most recently identified in a swine, compatible with a reassortment of Eurasian and North American swine viruses (Figure 1).

Materials and methods

Influenza sequences were obtained from the National Center for Biotechnology Information (NCBI) [22] in the United States. We performed a search using Basic Local Alignment Search Tool (BLAST) for each of the eight A/California/04/2009(H1N1) segments separately, recording the 50 best matches. Then we constructed the union of all these matches, taking the sequences for all their segments available in the database. We aligned these sequences using the stretcher algorithm as implemented in the EMBOSS package.

After the alignment we translate the sequences into the binary data, comparing them to the reference sequence site by site. A mutation maps to 1, while a nucleotide identical to that in a reference sequence maps to 0. Whenever there are masks, they map to the corresponding fractional numbers. Gaps are not counted as polymorphisms. Therefore, if there are the S sequences restricted to the P polymorphic sites, these data translate to the *SxP* matrix. Each row of this matrix can be thought of as a vector in a P-dimensional space, and it represents one of the sequences.

We perform the Principal Component Analysis (PCA) in order to determine the most significant coordinates in this P-dimensional space. After this we leave the principal components which capture 85% of the total variance, discard the remaining ones and project the data onto this relevant coordinate subset.

This procedure is followed by the consensus *K*-means clustering. Namely, if one targets for *K* clusters, one repeats the *K*-means clustering procedure *N* times, and forms the matrix *n* whose elements *nij (i,j=1,…,S)* represent the number of times out of the N trials when the i-th and j-th sequences were clustered together. In our analysis we set *N≥100*. The matrix of the distances between the samples is:

$$D_{ij} = 1 - \frac{n_{ij}}{N}.$$

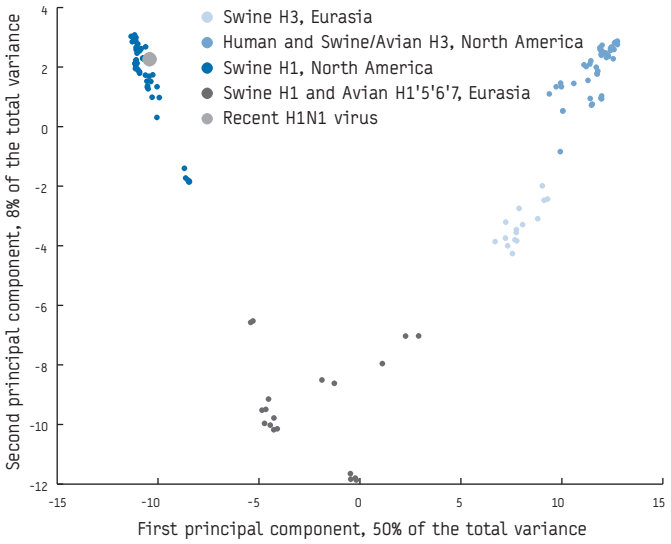
One then performs the standard hierarchical clustering with this matrix, targeting for the K clusters. This procedure does not depend on any assumptions made by the phylogenetic models. Note that these techniques can be used for inferring phylogenies as well [23], though this is beyond the scope of the present note.

Results

Sequence comparison of available sequences of the new A(H1N1) virus (as of 27 May 2009) did not identify significant sequence variation, except for a few point mutations. Hence A/

Figure 2a

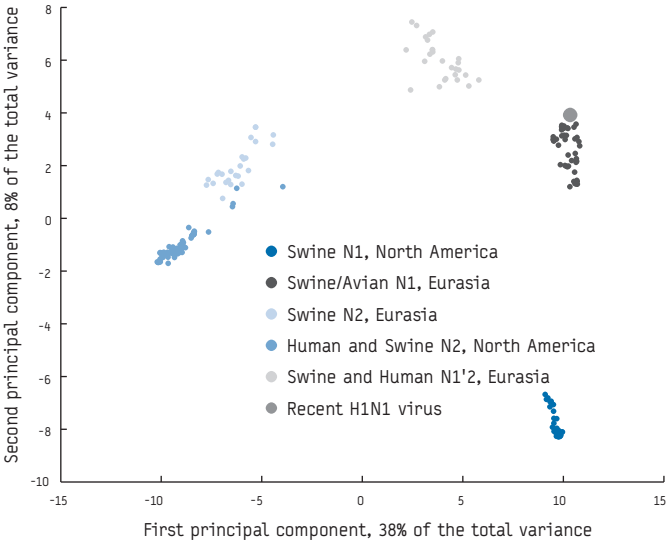
Cluster analysis of the new influenza A(H1N1) virus.
HA segment; data projected onto the first two principal components



Representation of the segment by segment analysis of the closest relatives to the 2009 H1N1 influenza viruses. Data is projected in the two axes of maximal variation. Clusters in different colors represent a distinct host and geographic location. Segments PB2, PB1, PA, HA, NP and NS are related to viruses isolated in swine in North America and NA and MP to swine viruses in Eurasia

Figure 2b

Cluster analysis of the new influenza A(H1N1) virus.
NA segment; data projected onto the first two principal components

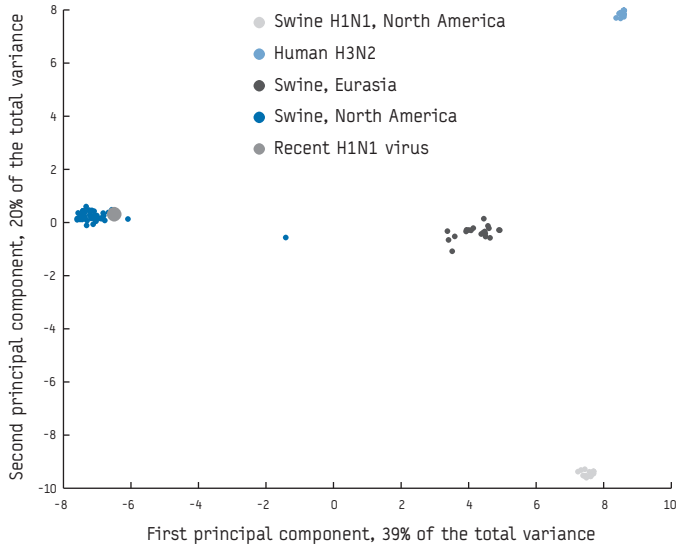


Representation of the segment by segment analysis of the closest relatives to the 2009 H1N1 influenza viruses. Data is projected in the two axes of maximal variation. Clusters in different colors represent a distinct host and geographic location. Segments PB2, PB1, PA, HA, NP and NS are related to viruses isolated in swine in North America and NA and MP to swine viruses in Eurasia

Figure 2c

Cluster analysis of the new influenza A(H1N1) virus.

PB2 segment; data projected onto the first two principal components



Representation of the segment by segment analysis of the closest relatives to the 2009 H1N1 influenza viruses. Data is projected in the two axes of maximal variation. Clusters in different colors represent a distinct host and geographic location. Segments PB2, PB1, PA, HA, NP and NS are related to viruses isolated in swine in North America and NA and MP to swine viruses in Eurasia

Figure 2d

Cluster analysis of the new influenza A(H1N1) virus.

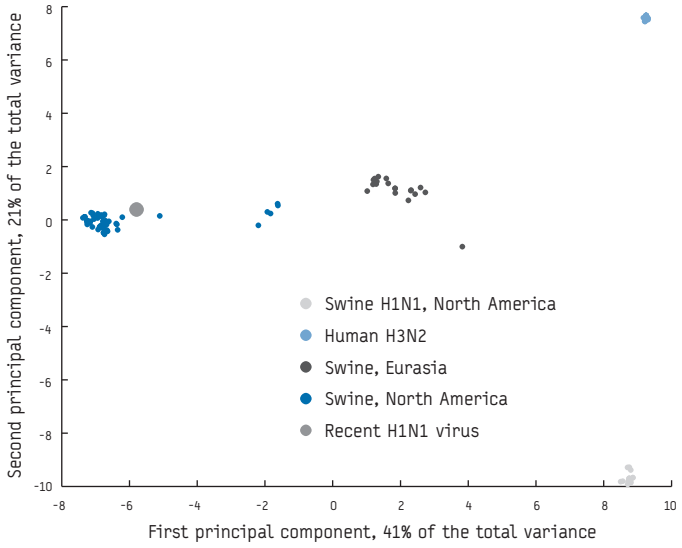
PB1 segment; data projected onto the first two principal components

Representation of the segment by segment analysis of the closest relatives to the 2009 H1N1 influenza viruses. Data is projected in the two axes of maximal variation. Clusters in different colors represent a distinct host and geographic location. Segments PB2, PB1, PA, HA, NP and NS are related to viruses isolated in swine in North America and NA and MP to swine viruses in Eurasia

Figure 2e

Cluster analysis of the new influenza A(H1N1) virus.

PA segment; data projected onto the first two principal components

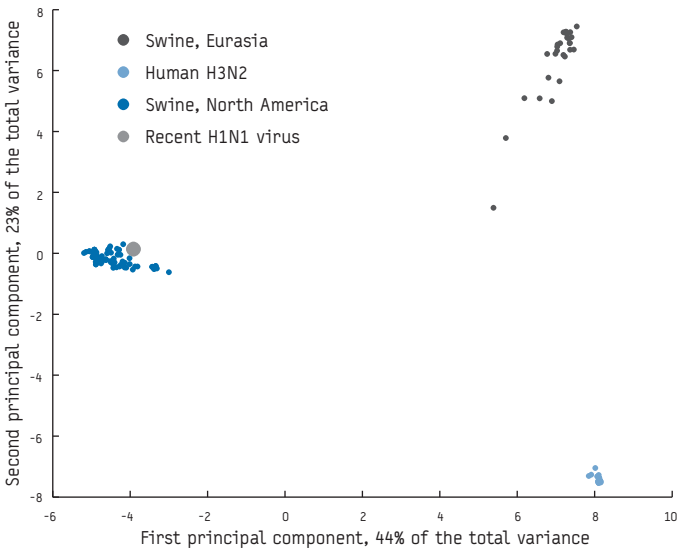


Representation of the segment by segment analysis of the closest relatives to the 2009 H1N1 influenza viruses. Data is projected in the two axes of maximal variation. Clusters in different colors represent a distinct host and geographic location. Segments PB2, PB1, PA, HA, NP and NS are related to viruses isolated in swine in North America and NA and MP to swine viruses in Eurasia

Figure 2f

Cluster analysis of the new influenza A(H1N1) virus.

NP segment; data projected onto the first two principal components

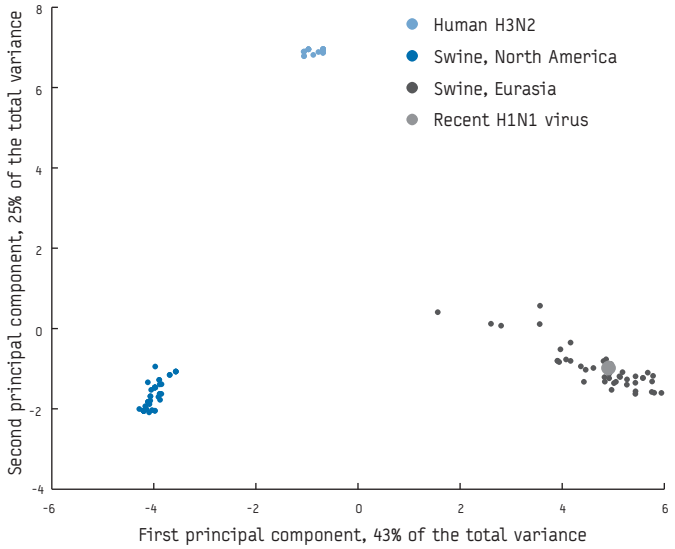


Representation of the segment by segment analysis of the closest relatives to the 2009 H1N1 influenza viruses. Data is projected in the two axes of maximal variation. Clusters in different colors represent a distinct host and geographic location. Segments PB2, PB1, PA, HA, NP and NS are related to viruses isolated in swine in North America and NA and MP to swine viruses in Eurasia

Figure 2g

Cluster analysis of the new influenza A(H1N1) virus.

MP segment; data projected onto the first two principal components

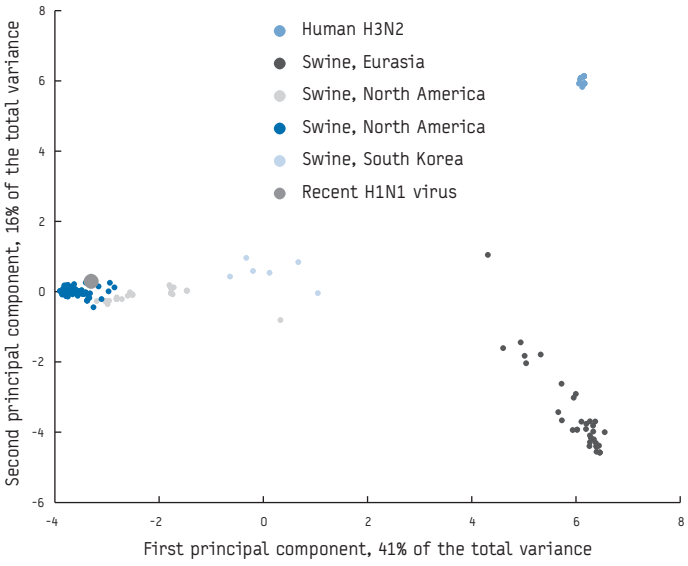


Representation of the segment by segment analysis of the closest relatives to the 2009 H1N1 influenza viruses. Data is projected in the two axes of maximal variation. Clusters in different colors represent a distinct host and geographic location. Segments PB2, PB1, PA, HA, NP and NS are related to viruses isolated in swine in North America and NA and MP to swine viruses in Eurasia

Figure 2h

Cluster analysis of the new influenza A(H1N1) virus.

NS segment; data projected onto the first two principal components



Representation of the segment by segment analysis of the closest relatives to the 2009 H1N1 influenza viruses. Data is projected in the two axes of maximal variation. Clusters in different colors represent a distinct host and geographic location. Segments PB2, PB1, PA, HA, NP and NS are related to viruses isolated in swine in North America and NA and MP to swine viruses in Eurasia

California/04/2009(H1N1) was chosen as the representative for further analyses. There are many different phylogenetic techniques, each of them with their own assumptions about evolutionary models that vary in the way of computing genetic distances, probabilities, etc. As opposed to phylogenetic techniques, cluster methods do not have a need for evaluation of a tree, which is a more complicated structure than a set of clusters. Clustering techniques do not provide a detailed phylogenetic structure because they analyse group features of the sequence data. That is why the clustering analysis is more robust to the assumptions we make, for instance, the choice of genetic distance. Unsupervised methods provide a way of identifying clusters without relying on previous information about the origins, host and time isolation.

Figures 2a-2h show the data projected onto the first two principal components with the corresponding percentage of variation. The figures clearly show that in all cases the new virus sequences clustered with those of swine viruses. The closest matches for each of the segments are summarised in the Table.

Our analyses support the hypotheses whereby the 2009 pandemic influenza A(H1N1) virus derives from one or multiple reassortment(s) between influenza A viruses circulating in swine in Eurasia and in North America. It is schematically illustrated in the Figure 1.

Supplementary Tables 1 to 8 show the results of the clustering for each of the eight segments (PB2, PB1, PA, HA, NP, NA, M NS):

http://www.eurosurveillance.org/public/public_pdf/Table_1_Cluster_analysis_HA.pdf

http://www.eurosurveillance.org/public/public_pdf/Table_2_Cluster_analysis_NA.pdf

http://www.eurosurveillance.org/public/public_pdf/Table_3_Cluster_analysis_PB2.pdf

http://www.eurosurveillance.org/public/public_pdf/Table_4_Cluster_analysis_PB1.pdf

http://www.eurosurveillance.org/public/public_pdf/Table_5_Cluster_analysis_PA.pdf

http://www.eurosurveillance.org/public/public_pdf/Table_6_Cluster_analysis_NP.pdf

Table

Closer clusters to the new influenza A(H1N1) virus.

Segment	Closest match	Years
PB2	Swine, North America	1998-2007
PB1	Swine, North America	1998-2007
PA	Swine, North America	1998-2007
HA	Swine H1, North America	1985-2007
NP	Swine, North America	1985-2007
NA	Avian/Swine N1, Eurasia	1982-2007
M	Swine, Eurasia	1980-2005
NS	Swine, North America	1998-2007

Closer clusters to each of the segments of the new influenza A(H1N1) virus. The analysis reveals two clusters of related viruses: North American swine viruses (in light blue) and Eurasian swine viruses (in dark blue).

http://www.eurosurveillance.org/public/public_pdf/Table_7_Cluster_analysis_MP.pdf

http://www.eurosurveillance.org/public/public_pdf/Table_8_Cluster_analysis_NS.pdf

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References

1. Webster RG, Laver WG. Studies on the origin of pandemic influenza. I. Antigenic analysis of A 2 influenza viruses isolated before and after the appearance of Hong Kong influenza using antisera to the isolated hemagglutinin subunits. Virology. 1972;48(2):433–444.
2. Y Kawaoka, S Krauss, and R G Webster, Avian-to-human transmission of the PB1 gene of influenza A viruses in the 1957 and 1968 pandemics. J Virol. 1989;63(11): 4603–4608.
3. Scholtissek C, von Hoyningen V, Rott R. Genetic relatedness between the new 1977 epidemic strains (H1N1) of influenza and human influenza strains isolated between 1947 and 1957 (H1N1). Virology. 1978;89(2):613–617.
4. Taubenberger JK, Reid AH, Lourens RM, Wang R, Jin G, Fanning TG., Characterization of the 1918 influenza virus polymerase genes., Nature. 2005;437(7060):889-93.
5. Rabadan R, Levine AJ, Robins H., Comparison of avian and human influenza A viruses reveals a mutational bias on the viral genomes. J Virol. 2006 Dec;80(23):11887-91.
6. Rabadan R, Levine AJ, Krasnitz M. Non-random reassortment in human influenza A viruses. Influenza Other Respi Viruses. 2008;2(1):9-22.
7. Nelson MI, Viboud C, Simonsen L, Bennett RT, Griesemer SB, St George K, et al. Multiple reassortment events in the evolutionary history of H1N1 influenza A virus since 1918. PLoS Pathog. 2008 Feb 29;4(2):e1000012.
8. Zhou NN, Senne DA, Landgraf JS, Swenson SL, Erickson G, Rossow K, et al. Genetic reassortment of avian, swine, and human influenza A viruses in American pigs. J Virol. 1999;73(10):8851-6.
9. Webby RJ, Swenson SL, Krauss SL, Gerrish PJ, Goyal SM, Webster RG. Evolution of swine H3N2 influenza viruses in the United States. J Virol. 2000;74(18):8243-51.
10. Lindstrom SE, Cox NJ, Klimov A. Genetic analysis of human H2N2 and early H3N2 influenza viruses, 1957-1972: evidence for genetic divergence and multiple reassortment events. Virology. 2004;328(1):101-19.
11. Ito T, Couceiro JN, Kelm S, Baum LG, Krauss S, Castrucci MR, et al. Molecular basis for the generation in pigs of influenza A viruses with pandemic potential. J Virol. 1998;72(9):7367-73.
12. Scholtissek C. Pigs as the 'mixing vessel' for the creation of new pandemic influenza A viruses. Med Princip Prac. 1990;2:65–71.
13. vanReeth K. Avian influenza in swine: a threat for the human population. Verh K Acad Geneeskd Belg. 2006;68(2):81-101.
14. World Health Organization (WHO). Influenza A(H1N1). Available from: http://www.who.int/csr/disease/swineflu/en/index.html
15. Centers for Disease Control and Prevention (CDC). H1N1 Swine flu. Available from: http://www.cdc.gov/h1n1flu/
16. Trifonov V, Khiabanian H, Greenbaum B, Rabadan R. The origin of the recent swine influenza A(H1N1) virus infecting humans. Euro Surveill. 2009;14(17):pii=19193. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19193
17. Garten RJ, Davis CT, Russell CA, Shu B, Lindstrom S, Balish A, et al. Antigenic and Genetic Characteristics of Swine-Origin 2009 A(H1N1) Influenza Viruses Circulating in Humans. Science. 22 May 2009 [Epub ahead of print] DOI: 10.1126/science.1176225
18. Novel Swine-Origin Influenza A (H1N1) Virus Investigation Team. Emergence of a Novel Swine-Origin Influenza A (H1N1) Virus in Humans. N Engl J Med. 22 May 2009. [Epub ahead of print].
19. Trifonov V, Khiabanian H, Rabadan R. Geographic Dependence, Surveillance, and Origins of the 2009 Influenza A (H1N1) Virus, New England Journal of Medicine, NEJM. 27 May 2009. [Epub ahead of print] DOI: 10.1056/NEJMp0904572.
20. Shinde V, Bridges CB, Uyeki TM, Shu B, Balish A, Xu X, et al. Triple-Reassortant Swine Influenza A (H1) in Humans in the United States, 2005-2009. N Engl J Med. 22 May 2009. [Epub ahead of print]
21. Rambaut A. Human/Swine A/H1N1 Influenza Origins and Evolution. 3 May 2009. Available from: http://tree.bio.ed.ac.uk/groups/influenza/
22. National Center for Biotechnology Information. Influenza virus resource, information, search and analysis. Available from: http://www.ncbi.nlm.nih.gov/genomes/FLU/FLU.html
23. Alexe G, Satya RV, Seiler M, Platt D, Bhanot T, Hui S, et al. PCA and clustering reveal alternate mtDNA phylogeny of N and M clades. J Mol Evol. 2008;67(5):465-87.

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Supplementary materials for

Cluster analysis of the origins of the new influenza A(H1N1) virus

Swine H3, EA, 15 sequences

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gi|125490284|gb|AB292402| /Avian/4 (HA)/H3N1/Hong Kong/1980/// Influenza A virus (A/duck/Hong Kong/836/1980(H3N1)) HA gene for haemagglutinin, complete cds.
gi|14275703|gb|AJ293926| /Human/4 (HA)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) partial ha gene for haemagglutinin, genomic RNA
gi|164511468|gb|AM746616| /Swine/4 (HA)/H3N2/Germany/2006/// Influenza A virus (A/wild boar/Germany/WS169/2006(H3N2)) H3 gene for hemagglutinin, genomic RNA
gi|38154813|gb|AY363520| /Swine/4 (HA)/H3N2/Hong Kong/1999/// Influenza A virus (A/swine/Hong Kong/5200/99(H3N2)) hemagglutinin (HA) gene, partial cds.
gi|38154823|gb|AY363525| /Swine/4 (HA)/H3N2/Hong Kong/2002/// Influenza A virus (A/swine/Hong Kong/1144/02(H3N2)) hemagglutinin (HA) gene, partial cds.
gi|89148252|gb|CY009372| /Swine/4 (HA)/H3N2/Spain/2001/// Influenza A virus (A/swine/Spain/33601/2001(H3N2)) segment 4, complete sequence
gi|89148095|gb|CY009380| /Swine/4 (HA)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/39139/2002(H3N2)) segment 4, complete sequence
gi|91177906|gb|CY010564| /Swine/4 (HA)/H3N2/Spain/2004/// Influenza A virus (A/swine/Spain/54008/2004(H3N2)) segment 4, complete sequence
gi|133981346|gb|CY020501| /Swine/4 (HA)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/42386/2002(H3N2)) segment 4, complete sequence
gi|148628607|gb|EF409247| /Swine/4 (HA)/H3N2/Germany/1992/// Influenza A virus (A/swine/Leipzig/145/92(H3N2)) hemagglutinin (HA) gene, complete cds
gi|148628609|gb|EF409248| /Swine/4 (HA)/H3N2/Germany/1996/// Influenza A virus (A/swine/Jena/5/96(H3N2)) hemagglutinin (HA) gene, complete cds
gi|148628611|gb|EF409249| /Swine/4 (HA)/H3N2/Germany/1997/// Influenza A virus (A/swine/Lohne/1/97(H3N2)) hemagglutinin (HA) gene, complete cds
gi|148628613|gb|EF409250| /Swine/4 (HA)/H3N2/Germany/1999/// Influenza A virus (A/swine/Bakum/8602/99(H3N2)) hemagglutinin (HA) gene, complete cds
gi|152207622|gb|EU037014| /Swine/4 (HA)/H3N1/Italy/2006/// Influenza A virus (A/swine/Italy/66945/2006(H3N1)) segment 4 hemagglutinin (HA) gene, complete cds.
gi|192382739|gb|EU826543| /Swine/4 (HA)/H3N2/Canada/2005/07/12/ Influenza A virus (A/swine/Quebec/4001/2005(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds

Human and Swine/Avian H3, NA, 54 sequences

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gi|9887129|gb|AF251403| /Swine/4 (HA)/H3N2/USA/1998/// Influenza A virus (A/Swine/Nebraska/209/98 (H3N2)) hemagglutinin (HA) gene, complete cds.
gi|9887146|gb|AF251411| /Swine/4 (HA)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/533/99 (H3N2)) hemagglutinin (HA) gene, complete cds.
gi|9887163|gb|AF251419| /Swine/4 (HA)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/569/99 (H3N2)) hemagglutinin (HA) gene, complete cds.
gi|110632007|gb|AF251427| /Swine/4 (HA)/H3N2/USA/1999/// Influenza A virus (A/Swine/Minnesota/593/99 (H3N2)) hemagglutinin (HA) gene, complete cds.
gi|18073259|gb|AJ252132| /Swine/4 (HA)/H3N2/Germany/1982/// Influenza A virus ha gene for heamagglutinin, strain A/swine/Potsdam/35/82 (H3N2)
gi|56159970|gb|AY779253| /Avian/4 (HA)/H3N2/USA/2003/// Influenza A virus (A/turkey/North Carolina/12344/03(H3N2)) hemagglutinin (HA) gene, complete cds
gi|56159972|gb|AY779254| /Avian/4 (HA)/H3N2/USA/2003/// Influenza A virus (A/turkey/Minnesota/764-2/03(H3N2)) hemagglutinin (HA) gene, complete cds
gi|91127726|gb|CY010652| /Human/4 (HA)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/611/1995(H3N2)) segment 4, complete sequence

gi|91127747|gb|CY010660| /Human/4 (HA)/H3N2/USA/1995/12/19/ Influenza A virus (A/New York/612/1995(H3N2)) segment 4, complete sequence
gi|91128161|gb|CY010668| /Human/4 (HA)/H3N2/USA/1996/01/10/ Influenza A virus (A/New York/613/1996(H3N2)) segment 4, complete sequence
gi|91128535|gb|CY010676| /Human/4 (HA)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/618/1995(H3N2)) segment 4, complete sequence
gi|91129935|gb|CY010708| /Human/4 (HA)/H3N2/USA/1995/12/12/ Influenza A virus (A/New York/628/1995(H3N2)) segment 4, complete sequence
gi|91130710|gb|CY010724| /Human/4 (HA)/H3N2/USA/1995/12/08/ Influenza A virus (A/New York/634/1995(H3N2)) segment 4, complete sequence
gi|94959627|gb|CY010812| /Human/4 (HA)/H3N2/USA/1995/12/29/ Influenza A virus (A/New York/623/1995(H3N2)) segment 4, complete sequence
gi|109675455|gb|CY011432| /Human/4 (HA)/H3N2/USA/1996/02/16/ Influenza A virus (A/New York/624/1996(H3N2)) segment 4, complete sequence
gi|109675493|gb|CY011448| /Human/4 (HA)/H3N2/USA/1996/01/18/ Influenza A virus (A/New York/635/1996(H3N2)) segment 4, complete sequence
gi|109675531|gb|CY011464| /Human/4 (HA)/H3N2/USA/1996/01/03/ Influenza A virus (A/New York/641/1996(H3N2)) segment 4, complete sequence
gi|109914686|gb|CY011888| /Human/4 (HA)/H3N2/USA/1994/01/17/ Influenza A virus (A/New York/716/1994(H3N2)) segment 4, complete sequence
gi|110333418|gb|CY012216| /Human/4 (HA)/H3N2/USA/1995/12/18/ Influenza A virus (A/New York/639/1995(H3N2)) segment 4, complete sequence
gi|110629728|gb|CY012744| /Human/4 (HA)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/771/1993(H3N2)) segment 4, complete sequence
gi|110629766|gb|CY012760| /Human/4 (HA)/H3N2/USA/1993/03/20/ Influenza A virus (A/New York/777/1993(H3N2)) segment 4, complete sequence
gi|110733706|gb|CY012968| /Human/4 (HA)/H3N2/USA/1994/01/14/ Influenza A virus (A/New York/735/1994(H3N2)) segment 4, complete sequence
gi|112789107|gb|CY013677| /Human/4 (HA)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/784/1993(H3N2)) segment 4, complete sequence
gi|112789164|gb|CY013701| /Human/4 (HA)/H3N2/USA/1993/04/05/ Influenza A virus (A/New York/789/1993(H3N2)) segment 4, complete sequence
gi|112789316|gb|CY013765| /Human/4 (HA)/H3N2/USA/1993/03/10/ Influenza A virus (A/New York/799/1993(H3N2)) segment 4, complete sequence
gi|115521540|gb|CY016483| /Human/4 (HA)/H3N2/USA/1993/03/11/ Influenza A virus (A/New York/800/1993(H3N2)) segment 4, complete sequence
gi|76574373|gb|DQ145537| /Swine/4 (HA)/H3N1/USA/2004/// Influenza A virus (A/swine/Minnesota/00395/2004(H3N1)) hemagglutinin gene, complete cds
gi|75756549|gb|DQ150425| /Swine/4 (HA)/H3N1/USA/2004/// Influenza A virus (A/swine/MI/PU243/04 (H3N1)) hemagglutinin (HA) gene, complete cds.
gi|75756565|gb|DQ150433| /Swine/4 (HA)/H3N1/USA/2004/// Influenza A virus (A/swine/IN/PU542/04 (H3N1)) hemagglutinin (HA) gene, complete cds.
gi|84626335|gb|DQ335771| /Avian/4 (HA)/H3N2/USA/2004/// Influenza A virus (A/turkey/Ohio/313053/04(H3N2)) hemagglutinin (HA) gene, complete cds
gi|94404583|gb|DQ469962| /Human/4 (HA)/H3N2/Canada/2005/// Influenza A virus (A/Ontario/RV1273/2005(H3N2)) hemagglutinin (HA) gene, complete cds
gi|94404585|gb|DQ469970| /Swine/4 (HA)/H3N2/Canada/2005/// Influenza A virus (A/swine/Alberta/14722/2005(H3N2)) hemagglutinin (HA) gene, complete cds
gi|94404587|gb|DQ469978| /Swine/4 (HA)/H3N2/Canada/2005/// Influenza A virus (A/swine/British Columbia/28103/2005(H3N2)) hemagglutinin (HA) gene, complete cds
gi|94404589|gb|DQ469986| /Swine/4 (HA)/H3N2/Canada/2005/// Influenza A virus (A/swine/Manitoba/12707/2005(H3N2)) hemagglutinin (HA) gene, complete cds
gi|94404591|gb|DQ469994| /Swine/4 (HA)/H3N2/Canada/2005/// Influenza A virus (A/swine/Ontario/33853/2005(H3N2)) hemagglutinin (HA) gene, complete cds

gi|94404593|gb|DQ470002| /Avian/4 (HA)/H3N2/Canada/2005/// Influenza A virus (A/turkey/Ontario/31232/2005(H3N2)) hemagglutinin (HA) gene, complete cds
gi|114215296|gb|DQ923506| /Swine/4 (HA)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ72-1/2006(H3N1)) hemagglutinin (HA) gene, complete cds
gi|114215298|gb|DQ923507| /Swine/4 (HA)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/CN22/2006(H3N1)) hemagglutinin (HA) gene, complete cds
gi|146454447|gb|EF551045| /Avian/4 (HA)/H3N2/USA/2004/// Influenza A virus (A/turkey/Illinois/2004(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds.
gi|146454465|gb|EF551053| /Swine/4 (HA)/H3N2/USA/2003/// Influenza A virus (A/swine/North Carolina/2003(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds.
gi|166080176|gb|EU301209| /Swine/4 (HA)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) hemagglutinin (HA) gene, complete cds.
gi|187763979|gb|EU697204| /Avian/4 (HA)/H3N2/USA/2005/// Influenza A virus (A/turkey/Minnesota/366767/2005(H3N2)) hemagglutinin (HA) gene, complete cds
gi|189313119|gb|EU735818| /Avian/4 (HA)/H3N2/USA/2004/// Influenza A virus (A/turkey/OH/313053/2004(H3N2)) hemagglutinin (HA) gene, complete cds
gi|189313100|gb|EU735826| /Avian/4 (HA)/H3N2/USA/2005/// Influenza A virus (A/turkey/NC/353568/2005(H3N2)) hemagglutinin (HA) gene, complete cds
gi|193877755|gb|EU743210| /Avian/4 (HA)/H3N2/USA/2005/// Influenza A virus (A/turkey/MN/366767/2005(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds.
gi|190403720|gb|EU798789| /Swine/4 (HA)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/CAS05/2004(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403722|gb|EU798790| /Swine/4 (HA)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAN04/2005(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403724|gb|EU798791| /Swine/4 (HA)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS07/2005(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403726|gb|EU798792| /Swine/4 (HA)/H3N2/South Korea/2006/// Influenza A virus (A/swine/Korea/CAS09/2006(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403728|gb|EU798793| /Swine/4 (HA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY04/2007(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403730|gb|EU798794| /Swine/4 (HA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY05/2007(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403732|gb|EU798795| /Swine/4 (HA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY07/2007(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403734|gb|EU798796| /Swine/4 (HA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY09/2007(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403736|gb|EU798797| /Swine/4 (HA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY10/2007(H3N2)) segment 4 hemagglutinin (HA) gene, complete cds

Swine H1, NA, 67 sequences

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gi|216409285|gb|AB434320| /Swine/4 (HA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/NIAH589/2005(H1N1)) HA gene for hemagglutinin, complete cds
gi|216409303|gb|AB434328| /Swine/4 (HA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chachoengsao/NIAH587/2005(H1N1)) HA gene for hemagglutinin, complete cds
gi|8515423|gb|AF250124| /Swine/4 (HA)/H1N2/USA/1999/// Influenza A virus (A/Swine/Indiana/9K035/99 (H1N2)) segment 4 hemagglutinin (HA) gene, complete cds.
gi|19422076|gb|AF455675| /Swine/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Ohio/891/01(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|19422078|gb|AF455676| /Swine/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/98225/01(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|19422080|gb|AF455677| /Swine/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/93523/01 (H1N2)) hemagglutinin (HA) gene, complete cds.

gi|19422082|gb|AF455678| /Swine/4 (HA)/H1N2/USA/2000/// Influenza A virus (A/Swine/Minnesota/55551/00 (H1N2)) hemagglutinin (HA) gene, complete cds
gi|19422084|gb|AF455679| /Swine/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Iowa/930/01(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|19422086|gb|AF455680| /Swine/4 (HA)/H1N2/USA/2000/// Influenza A virus (A/Swine/Indiana/P12439/00 (H1N2)) hemagglutinin (HA) gene, complete cds.
gi|19422088|gb|AF455681| /Swine/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100085A/01 (H1N2)) hemagglutinin (HA) gene, complete cds.
gi|19422090|gb|AF455682| /Swine/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100084/01 (H1N2)) hemagglutinin (HA) gene, complete cds.
gi|19848287|gb|AY038014| /Avian/4 (HA)/H1N2/USA/1999/// Influenza A virus (A/Turkey/MO/24093/99(H1N2)) hemagglutinin (H1) gene, complete cds.
gi|17223878|gb|AY060047| /Swine/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/SW/MN/23124-T/01(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|17223880|gb|AY060048| /Swine/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/SW/MN/23124-S/01(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|17223884|gb|AY060050| /Swine/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/SW/MN/16419/01(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|24286062|gb|AY129156| /Swine/4 (HA)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) hemagglutinin (HA) mRNA, complete cds
gi|30522967|gb|AY233393| /Avian/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/duck/NC/91347/01(H1N2)) hemagglutinin (HA) gene, complete cds
gi|149785303|gb|CY022317| /Swine/4 (HA)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/1/1985(H1N1)) segment 4, complete sequence
gi|149785253|gb|CY022325| /Swine/4 (HA)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/3/1985(H1N1)) segment 4, complete sequence
gi|149785158|gb|CY022333| /Swine/4 (HA)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/17672/1988(H1N1)) segment 4, complete sequence
gi|149785123|gb|CY022429| /Swine/4 (HA)/H1N1/USA/1988/// Influenza A virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 4, complete sequence
gi|149785050|gb|CY022469| /Swine/4 (HA)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3228/1987(H1N1)) segment 4, complete sequence
gi|149784960|gb|CY022477| /Swine/4 (HA)/H1N1/USA/1991/// Influenza A virus (A/swine/Maryland/23239/1991(H1N1)) segment 4, complete sequence
gi|152963528|gb|CY022970| /Swine/4 (HA)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/31483/1988(H1N1)) segment 4, complete sequence
gi|156536558|gb|CY024925| /Human/4 (HA)/H1N1/USA/1988/// Influenza A virus (A/Ohio/3559/1988(H1N1)) segment 4, complete sequence
gi|156536594|gb|CY025010| /Swine/4 (HA)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3024/1987(H1N1)) segment 4, complete sequence
gi|158525295|gb|CY027155| /Swine/4 (HA)/H1N1/USA/1991/// Influenza A virus (A/swine/Iowa/24297/1991(H1N1)) segment 4, complete sequence
gi|158958057|gb|CY027507| /Swine/4 (HA)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/2/1985(H1N1)) segment 4, complete sequence
gi|166203488|gb|CY028780| /Swine/4 (HA)/H1N1/USA/1991/// Influenza A virus (A/swine/California/T9001707/1991(H1N1)) segment 4, complete sequence
gi|208400878|gb|CY035070| /Swine/4 (HA)/H1N1/USA/1990/// Influenza A virus (A/swine/Memphis/1/1990(H1N1)) segment 4, complete sequence
gi|229807652|gb|CY039917| /Swine/4 (HA)/H1N1/USA/1988/// Influenza A Virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 4, complete sequence
gi|229809512|gb|CY039925| /Swine/4 (HA)/H1N1/USA/1988/// Influenza A Virus (A/swine/Indiana/1726/1988(H1N1)) segment 4, complete sequence
gi|109501337|gb|DQ666933| /Swine/4 (HA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/S11/2005(H1N2)) segment 4 hemagglutinin gene, complete cds.

gi|112456301|gb|DQ889689| /Human/4 (HA)/H1N1/USA/2005/// Influenza A virus (A/Iowa/CEID23/2005(H1N1)) hemagglutinin (HA) gene, complete cds
gi|117935788|gb|EF101741| /Human/4 (HA)/H1N2/Philippines/2004/02/27/ Influenza A virus (A/Philippines/344/2004(H1N2)) hemagglutinin gene, complete cds
gi|117935790|gb|EF101749| /Human/4 (HA)/H1N1/Thailand/2005/07/14/ Influenza A virus (A/Thailand/271/2005(H1N1)) hemagglutinin gene, complete cds
gi|146706468|gb|EF556199| /Swine/4 (HA)/H1N2/China/2006/// Influenza A virus (A/swine/Guangxi/13/2006(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|146706487|gb|EF556201| /Swine/4 (HA)/H1N2/China/2005/// Influenza A virus (A/swine/Guangxi/17/2005(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|146706513|gb|EF556203| /Swine/4 (HA)/H1N2/China/2005/// Influenza A virus (A/swine/Hainan/1/2005(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|157168447|gb|EU139827| /Swine/4 (HA)/H1N1/USA/1999/// Influenza A virus (A/swine/Minnesota/37866/1999(H1N1)) hemagglutinin (HA) gene, complete cds.
gi|157168449|gb|EU139828| /Swine/4 (HA)/H1N2/USA/2001/// Influenza A virus (A/swine/Minnesota/1192/2001(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|157168453|gb|EU139830| /Swine/4 (HA)/H1N2/USA/2003/// Influenza A virus (A/swine/Minnesota/00194/2003(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|157168455|gb|EU139831| /Swine/4 (HA)/H1N2/USA/2004/// Influenza A virus (A/swine/Kansas/00246/2004(H1N2)) hemagglutinin (HA) gene, complete cds.
gi|163676469|gb|EU296599| /Swine/4 (HA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/NIAH589/2005(H1N1)) hemagglutinin (HA) gene, complete cds
gi|163676471|gb|EU296601| /Swine/4 (HA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chachoengsao/NIAH587/2005(H1N1)) hemagglutinin (HA) gene, complete cds
gi|163676473|gb|EU296603| /Swine/4 (HA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/05CB1/2005(H1N1)) hemagglutinin (HA) gene, complete cds
gi|163676475|gb|EU296605| /Swine/4 (HA)/H1N1/Thailand/2006/// Influenza A virus (A/swine/Chonburi/06CB2/2006(H1N1)) hemagglutinin (HA) gene, complete cds
gi|189313195|gb|EU735786| /Avian/4 (HA)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/19762/1988(H1N1)) hemagglutinin (HA) gene, complete cds.
gi|193877846|gb|EU743159| /Avian/4 (HA)/H1N1/USA/1992/// Influenza A virus (A/turkey/IA/21089-3/1992(H1N1)) segment 4 hemagglutinin (HA) gene, complete cds.
gi|190403698|gb|EU798778| /Swine/4 (HA)/H1N1/South Korea/2004/// Influenza A virus (A/swine/Korea/CAN01/2004(H1N1)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403700|gb|EU798779| /Swine/4 (HA)/H1N1/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS08/2005(H1N1)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403702|gb|EU798780| /Swine/4 (HA)/H1N2/South Korea/2004/// Influenza A virus (A/swine/Korea/Hongsong2/2004(H1N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403704|gb|EU798781| /Swine/4 (HA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL01/2005(H1N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403706|gb|EU798782| /Swine/4 (HA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL02/2005(H1N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403708|gb|EU798783| /Swine/4 (HA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL04/2005(H1N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403710|gb|EU798784| /Swine/4 (HA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/Asan04/2006(H1N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403712|gb|EU798785| /Swine/4 (HA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ4/2006(H1N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403714|gb|EU798786| /Swine/4 (HA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ7/2006(H1N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403716|gb|EU798787| /Swine/4 (HA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ14/2006(H1N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|190403718|gb|EU798788| /Swine/4 (HA)/H1N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY08/2007(H1N2)) segment 4 hemagglutinin (HA) gene, complete cds

gi|209164817|gb|FJ357104| /Avian/4 (HA)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/17026/1988(H1N1)) segment 4 hemagglutinin (HA) gene, complete cds
gi|209486604|gb|FJ374511| /Swine/4 (HA)/H1N2/China/2007/03/24/ Influenza A virus (A/swine/Shanghai/1/2007(H1N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|438591|gb|L24362| /Human/4 (HA)/H1N1/USA/1991/// Influenza A virus (A/MD/12/1991(H1N1)) hemagglutinin (HA) gene, complete cds.
gi|325055|gb|M81707| /Swine/4 (HA)/H1N1/USA/1988/// Influenza A virus (A/Swine/Indiana/1726/1988(H1N1)) haemagglutinin gene, complete cds.
gi|1399602|gb|U53162| /Human/4 (HA)/H1N1/USA/1994/// Influenza A virus (A/WI/4754/1994(H1N1)) hemagglutinin (HA) mRNA, complete cds
gi|1399604|gb|U53163| /Human/4 (HA)/H1N1/USA/1994/// Influenza A virus (A/WI/4755/1994(H1N1)) hemagglutinin (HA) mRNA, complete cds
gi|227809829|gb|FJ966082| /Human/4 (HA)/H1N1/USA/2009/04/01/ Influenza A virus (A/California/04/2009(H1N1)) segment 4 hemagglutinin (HA) gene, complete cds

Swine H1 and Avian H1'5'6'7, EA, 19 sequences
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gi|113531184|gb|AB271113| /Avian/4 (HA)/H1N1/Japan/1977/// Influenza A virus (A/duck/Miyagi/66/77(H1N1)) HA gene for haemagglutinin, complete cds
gi|113531188|gb|AB271115| /Avian/4 (HA)/H1N1/Japan/1996/// Influenza A virus (A/duck/Hokkaido/55/96(H1N1)) HA gene for haemagglutinin, complete cds
gi|113531192|gb|AB271117| /Avian/4 (HA)/H10N1/Hong Kong/1980/// Influenza A virus (A/duck/Hong Kong/938/80(H10N1)) HA gene for haemagglutinin, complete cds.
gi|126149244|gb|AB294215| /Avian/4 (HA)/H6N1/Hong Kong/1979/// Influenza A virus (A/duck/Hong Kong/716/1979(H6N1)) HA gene for haemagglutinin, complete cds.
gi|195183823|gb|AB450451| /Avian/4 (HA)/H11N1/Japan/1977/// Influenza A virus (A/duck/Miyagi/47/1977(H11N1)) HA gene for haemagglutinin, complete cds.
gi|4585174|gb|AF091316| /Swine/4 (HA)/H1N1/Belgium/1983/// Influenza A virus (A/swine/Belgium/1/83(H1N1)) segment 4 hemagglutinin precursor (HA) mRNA, complete cds.
gi|18074896|gb|AJ410542| /Avian/4 (HA)/H6N1/Hong Kong/1977/// Influenza A virus genomic RNA for haemagglutinin (ha gene) strain A/duck/Hong Kong/175/77 (H6N1)
gi|18074900|gb|AJ410544| /Avian/4 (HA)/H6N1/Hong Kong/1977/// Influenza A virus genomic RNA for haemagglutinin (ha gene) strain A/duck/Hong Kong/202/77 (H6N1)
gi|159149089|gb|AY296064| /Avian/4 (HA)/H5N2/USA/1998/// Influenza A virus (A/chukar/MN/14591-7/1998(H5N2)) segment 4 hemagglutinin (HA) gene, complete cds
gi|78097593|gb|CY005605| /Avian/4 (HA)/H6N1/Hong Kong/1977/// Influenza A virus (A/chicken/Hong Kong/17/1977(H6N1)) segment 4, complete sequence
gi|89789278|gb|CY009892| /Swine/4 (HA)/H1N1/Spain/2003/// Influenza A virus (A/Swine/Spain/50047/2003(H1N1)) segment 4, complete sequence
gi|91125694|gb|CY010572| /Swine/4 (HA)/H1N1/Spain/2003/// Influenza A virus (A/swine/Spain/51915/2003(H1N1)) segment 4, complete sequence
gi|91177887|gb|CY010580| /Swine/4 (HA)/H1N1/Spain/2004/// Influenza A virus (A/swine/Spain/53207/2004(H1N1)) segment 4, complete sequence
gi|115278134|gb|CY014612| /Avian/4 (HA)/H7N1/China/1992/// Influenza A virus (A/duck/Nanchang/1904/1992(H7N1)) segment 4, complete sequence
gi|85062566|gb|DQ343151| /Avian/4 (HA)/H5N1/China/2001/// Influenza A virus (A/chicken/Hebei/718/2001(H5N1)) hemagglutinin (HA) gene, complete cds.
gi|153957928|gb|EU053133| /Swine/4 (HA)/H1N2/Germany/2005/12/07/ Influenza A virus (A/swine/Doetlingen/IDT4735/2005(H1N2)) segment 4 hemagglutinin gene, complete cds.
gi|153958033|gb|EU053141| /Swine/4 (HA)/H1N2/Germany/2005/12/13/ Influenza A virus (A/swine/Cloppenburg/IDT4777/2005(H1N2)) segment 4 hemagglutinin gene, complete cds.
gi|210076636|gb|FJ415610| /Swine/4 (HA)/H1N1/China/2007/11/15/ Influenza A virus (A/swine/Zhejiang/1/2007(H1N1)) segment 4 hemagglutinin (HA) gene, complete cds

gi|211996952|gb|FJ432778| /Avian/4 (HA)/H1N1/Italy/2003/// Influenza A virus (A/goose/Italy/296426/2003(H1N1)) segment 4 hemagglutinin (HA) gene, complete cds

Swine N1, NA, 32 sequences

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gi|29539577|gb|AF342820| /Human/6 (NA)/H1N1/USA/1998/// Influenza A virus (A/Wisconsin/10/98 (H1N1)) neuraminidase gene, complete cds
gi|149785308|gb|CY022319| /Swine/6 (NA)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/1/1985(H1N1)) segment 6, complete sequence
gi|149785259|gb|CY022327| /Swine/6 (NA)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/3/1985(H1N1)) segment 6, complete sequence
gi|149785187|gb|CY022335| /Swine/6 (NA)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/17672/1988(H1N1)) segment 6, complete sequence
gi|149785128|gb|CY022431| /Swine/6 (NA)/H1N1/USA/1988/// Influenza A virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 6, complete sequence
gi|149785055|gb|CY022471| /Swine/6 (NA)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3228/1987(H1N1)) segment 6, complete sequence
gi|149784975|gb|CY022479| /Swine/6 (NA)/H1N1/USA/1991/// Influenza A virus (A/swine/Maryland/23239/1991(H1N1)) segment 6, complete sequence
gi|152963533|gb|CY022972| /Swine/6 (NA)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/31483/1988(H1N1)) segment 6, complete sequence
gi|156536563|gb|CY024927| /Human/6 (NA)/H1N1/USA/1988/// Influenza A virus (A/Ohio/3559/1988(H1N1)) segment 6, complete sequence
gi|156536599|gb|CY025012| /Swine/6 (NA)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3024/1987(H1N1)) segment 6, complete sequence
gi|158525300|gb|CY027157| /Swine/6 (NA)/H1N1/USA/1991/// Influenza A virus (A/swine/Iowa/24297/1991(H1N1)) segment 6, complete sequence
gi|158958062|gb|CY027509| /Swine/6 (NA)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/2/1985(H1N1)) segment 6, complete sequence
gi|166203493|gb|CY028782| /Swine/6 (NA)/H1N1/USA/1991/// Influenza A virus (A/swine/California/T9001707/1991(H1N1)) segment 6, complete sequence
gi|208400883|gb|CY035072| /Swine/6 (NA)/H1N1/USA/1990/// Influenza A virus (A/swine/Memphis/1/1990(H1N1)) segment 6, complete sequence
gi|229807657|gb|CY039919| /Swine/6 (NA)/H1N1/USA/1988/// Influenza A Virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 6, complete sequence
gi|229809517|gb|CY039927| /Swine/6 (NA)/H1N1/USA/1988/// Influenza A Virus (A/swine/Indiana/1726/1988(H1N1)) segment 6, complete sequence
gi|76574375|gb|DQ145538| /Swine/6 (NA)/H3N1/USA/2004/// Influenza A virus (A/swine/Minnesota/00395/2004(H3N1)) neuraminidase gene, complete cds
gi|75756553|gb|DQ150427| /Swine/6 (NA)/H3N1/USA/2004/// Influenza A virus (A/swine/MI/PU243/04 (H3N1)) neuraminidase (NA) gene, complete cds.
gi|75756569|gb|DQ150435| /Swine/6 (NA)/H3N1/USA/2004/// Influenza A virus (A/swine/IN/PU542/04 (H3N1)) neuraminidase (NA) gene, complete cds.
gi|112456255|gb|DQ889687| /Human/6 (NA)/H1N1/USA/2005/// Influenza A virus (A/Iowa/CEID23/2005(H1N1)) neuraminidase (NA) gene, complete cds
gi|114215300|gb|DQ923508| /Swine/6 (NA)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ72-1/2006(H3N1)) neuraminidase (NA) gene, complete cds
gi|157168467|gb|EU139837| /Swine/6 (NA)/H1N1/USA/1999/// Influenza A virus (A/swine/Minnesota/37866/1999(H1N1)) neuraminidase (NA) gene, complete cds
gi|188572591|gb|EU409949| /Swine/6 (NA)/H1N1/USA/2007/// Influenza A virus (A/swine/Ohio/24366/07(H1N1)) neuraminidase (NA) gene, complete cds
gi|188572593|gb|EU409956| /Swine/6 (NA)/H1N1/USA/2004/// Influenza A virus (A/swine/Ohio/75004/04(H1N1)) neuraminidase (NA) gene, complete cds
gi|188572595|gb|EU409961| /Swine/6 (NA)/H1N1/USA/2006/// Influenza A virus (A/swine/Ohio/C62006/06(H1N1)) neuraminidase (NA) gene, complete cds

gi|189313200|gb|EU735788| /Avian/6 (NA)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/19762/1988(H1N1)) neuraminidase (NA) gene, complete cds.
gi|193877859|gb|EU743153| /Avian/6 (NA)/H1N1/USA/1990/// Influenza A virus (A/turkey/IA/10271-3/1990(H1N1)) segment 6 neuraminidase (NA) gene, complete cds.
gi|193877841|gb|EU743161| /Avian/6 (NA)/H1N1/USA/1992/// Influenza A virus (A/turkey/IA/21089-3/1992(H1N1)) segment 6 neuraminidase (NA) gene, complete cds.
gi|190403799|gb|EU798818| /Swine/6 (NA)/H1N1/South Korea/2004/// Influenza A virus (A/swine/Korea/CAN01/2004(H1N1)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403801|gb|EU798819| /Swine/6 (NA)/H1N1/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS08/2005(H1N1)) segment 6 neuraminidase (NA) gene, complete cds
gi|209164822|gb|FJ357106| /Avian/6 (NA)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/17026/1988(H1N1)) segment 6 neuraminidase (NA) gene, complete cds
gi|1399610|gb|U53166| /Human/6 (NA)/H1N1/USA/1994/// Influenza A virus (A/WI/4754/1994(H1N1)) neuraminidase (NA) mRNA, complete cds

Swine/Avian N1, EA, 47 sequences
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gi|113531186|gb|AB271114| /Avian/6 (NA)/H1N1/Japan/1977/// Influenza A virus (A/duck/Miyagi/66/77(H1N1)) NA gene for neuraminidase, complete cds
gi|113531190|gb|AB271116| /Avian/6 (NA)/H1N1/Japan/1996/// Influenza A virus (A/duck/Hokkaido/55/96(H1N1)) NA gene for neuraminidase, complete cds
gi|113531194|gb|AB271118| /Avian/6 (NA)/H10N1/Hong Kong/1980/// Influenza A virus (A/duck/Hong Kong/938/80(H10N1)) NA gene for neuraminidase, complete cds.
gi|125490286|gb|AB292403| /Avian/6 (NA)/H3N1/Hong Kong/1980/// Influenza A virus (A/duck/Hong Kong/836/1980(H3N1)) NA gene for neuraminidase, complete cds.
gi|126149246|gb|AB294216| /Avian/6 (NA)/H6N1/Hong Kong/1979/// Influenza A virus (A/duck/Hong Kong/716/1979(H6N1)) NA gene for neuraminidase, complete cds.
gi|216409289|gb|AB434322| /Swine/6 (NA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/NIAH589/2005(H1N1)) NA gene for neuraminidase, complete cds
gi|216409307|gb|AB434330| /Swine/6 (NA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chachoengsao/NIAH587/2005(H1N1)) NA gene for neuraminidase, complete cds
gi|195183825|gb|AB450452| /Avian/6 (NA)/H11N1/Japan/1977/// Influenza A virus (A/duck/Miyagi/47/1977(H11N1)) NA gene for neuraminidase, complete cds.
gi|13260593|gb|AF250366| /Swine/6 (NA)/H1N1/United Kingdom/1992/// Influenza A virus (A/Swine/England/195852/92 (H1N1)) neuraminidase (NA) gene, complete cds
gi|18074944|gb|AJ410566| /Avian/6 (NA)/H6N1/Hong Kong/1977/// Influenza A virus genomic RNA for neuraminidase (na gene) strain A/duck/Hong Kong/175/77 (H6N1)
gi|18074946|gb|AJ410567| /Avian/6 (NA)/H6N1/Hong Kong/1977/// Influenza A virus genomic RNA for neuraminidase (na gene) strain A/duck/Hong Kong/202/77 (H6N1)
gi|20068202|gb|AJ410876| /Swine/6 (NA)/H1N1/Italy/1995/// Influenza A virus (swine/Italy/1424-4/95 (H1N1)) partial N1NA gene for Neuraminidase, genomic RNA
gi|20068208|gb|AJ410879| /Swine/6 (NA)/H1N1/Italy/1997/// Influenza A virus (swine/Italy/1492/97 (H1N1)) partial N1NA gene for Neuraminidase, genomic RNA
gi|20068210|gb|AJ410880| /Swine/6 (NA)/H1N1/Italy/1997/// Influenza A virus (swine/Italy/1509-6/97 (H1N1)) partial N1NA gene for Neuraminidase, genomic RNA
gi|20068212|gb|AJ410881| /Swine/6 (NA)/H1N1/France/1999/// Influenza A virus (swine/Cotes d'Armor/1488/99 (H1N1)) partial N1NA gene for Neuraminidase, genomic RNA
gi|20068214|gb|AJ410882| /Swine/6 (NA)/H1N1/France/1999/// Influenza A virus (swine/Ille et Vilaine/1455/99 (H1N1)) partial N1NA gene for Neuraminidase, genomic RNA
gi|20068218|gb|AJ410884| /Swine/6 (NA)/H1N1/France/1999/// Influenza A virus (swine/Cotes d'Armor/1515/99 (H1N1)) partial N1NA gene for Neuraminidase, genomic RNA
gi|20068220|gb|AJ412689| /Swine/6 (NA)/H1N1/France/1984/// Influenza A virus (A/swine/Finistere/3616/84(H1N1)) NAN1 gene for neuraminidase, genomic RNA

gi|20068222|gb|AJ412690| /Swine/6 (NA)/H1N1/Belgium/1983/// Influenza A virus (A/swine/Belgium/1/83(H1N1)) NAN1 gene for neuraminidase, genomic RNA
gi|20068224|gb|AJ412691| /Swine/6 (NA)/H1N1/Belgium/1985/// Influenza A virus (A/swine/Belgium/74/85(H1N1)) partial NAN1 gene for neuraminidase, genomic RNA
gi|20068226|gb|AJ412692| /Swine/6 (NA)/H1N1/France/1982/// Influenza A virus (A/swine/Lot/2979/82(H1N1)) NAN1 gene for neuraminidase, genomic RNA
gi|39840719|gb|AJ416626| /Avian/6 (NA)/H1N1/France/1987/// Influenza A virus (A/turkey/France/87075/87(H1N1)) N1 gene for neuraminidase, genomic RNA
gi|39840725|gb|AJ416629| /Avian/6 (NA)/H7N1/United Kingdom/1979/// Influenza A virus (A/African starling/England/983/79(H7N1)) N1 gene for neuraminidase, genomic RNA
gi|37955282|gb|AY207527| /Avian/6 (NA)/H7N1/China/1992/// Influenza A virus (A/duck/Nanchang/1944/92(H7N1)) neuraminidase (NA) gene, complete cds
gi|37955296|gb|AY207534| /Avian/6 (NA)/H1N1/Japan/1977/// Influenza A virus (A/duck/Miyagil/9/77(H1N1)) neuraminidase (NA) gene, complete cds
gi|37955304|gb|AY207538| /Avian/6 (NA)/H7N1/South Africa/1992/// Influenza A virus (A/softbill/South Africa/142/92(H7N1)) neuraminidase (NA) gene, complete cds
gi|37955308|gb|AY207540| /Avian/6 (NA)/H2N1/Germany/1981/// Influenza A virus (A/mallard/Stralsund/41-6/81(H2N1)) neuraminidase (NA) gene, complete cds
gi|78097310|gb|CY005495| /Avian/6 (NA)/H7N1/China/1992/// Influenza A virus (A/duck/Nanchang/1904/1992(H7N1)) segment 6, complete sequence
gi|78097598|gb|CY005607| /Avian/6 (NA)/H6N1/Hong Kong/1977/// Influenza A virus (A/chicken/Hong Kong/17/1977(H6N1)) segment 6, complete sequence
gi|89789283|gb|CY009894| /Swine/6 (NA)/H1N1/Spain/2003/// Influenza A virus (A/Swine/Spain/50047/2003(H1N1)) segment 6, complete sequence
gi|91125699|gb|CY010574| /Swine/6 (NA)/H1N1/Spain/2003/// Influenza A virus (A/swine/Spain/51915/2003(H1N1)) segment 6, complete sequence
gi|91177892|gb|CY010582| /Swine/6 (NA)/H1N1/Spain/2004/// Influenza A virus (A/swine/Spain/53207/2004(H1N1)) segment 6, complete sequence
gi|85681812|gb|DQ349117| /Avian/6 (NA)/H5N1/China/2001/// Influenza A virus (A/chicken/Hebei/718/2001(H5N1)) neuraminidase (NA) gene, complete cds.
gi|117935804|gb|EF101756| /Human/6 (NA)/H1N1/Thailand/2005/07/14/ Influenza A virus (A/Thailand/271/2005(H1N1)) neuraminidase gene, complete cds
gi|149212747|gb|EF443160| /Avian/6 (NA)/H3N1/India/1980/// Influenza A virus (A/duck/India/836/1980(H3N1)) neuraminidase (NA) gene, partial cds.
gi|152207624|gb|EU037015| /Swine/6 (NA)/H3N1/Italy/2006/// Influenza A virus (A/swine/Italy/66945/2006(H3N1)) segment 6 neuroaminidase (NA) gene, complete cds.
gi|195933628|gb|EU045388| /Swine/6 (NA)/H1N1/Italy/2004/// Influenza A virus (A/swine/Italy/53949/2004(H1N1)) neuraminidase (NA) gene, complete cds.
gi|195933630|gb|EU045389| /Swine/6 (NA)/H1N1/Italy/2004/// Influenza A virus (A/swine/Italy/65296/2004(H1N1)) neuraminidase (NA) gene, complete cds.
gi|195933632|gb|EU045393| /Swine/6 (NA)/H1N1/Italy/2004/// Influenza A virus (A/swine/Italy/247578/2004(H1N1)) neuraminidase (NA) gene, complete cds.
gi|163676445|gb|EU296600| /Swine/6 (NA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/NIAH589/2005(H1N1)) neuraminidase (NA) gene, complete cds
gi|163676447|gb|EU296602| /Swine/6 (NA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chachoengsao/NIAH587/2005(H1N1)) neuraminidase (NA) gene, complete cds
gi|163676449|gb|EU296604| /Swine/6 (NA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/05CB1/2005(H1N1)) neuraminidase (NA) gene, complete cds
gi|163676451|gb|EU296606| /Swine/6 (NA)/H1N1/Thailand/2006/// Influenza A virus (A/swine/Chonburi/06CB2/2006(H1N1)) neuraminidase (NA) gene, complete cds
gi|210076638|gb|FJ415611| /Swine/6 (NA)/H1N1/China/2007/11/15/ Influenza A virus (A/swine/Zhejiang/1/2007(H1N1)) segment 6 neuraminidase (NA) gene, complete cds
gi|211996957|gb|FJ432780| /Avian/6 (NA)/H1N1/Italy/2003/// Influenza A virus (A/goose/Italy/296426/2003(H1N1)) segment 6 neuraminidase (NA) gene, complete cds

gi|324441|gb|K02252| /Avian/6 (NA)/H7N1/Ireland/1973/// Influenza A virus (A/parrot/Ulster/1973(H7N1)) neuraminidase gene, complete cds
gi|227809833|gb|FJ966084| /Human/6 (NA)/H1N1/USA/2009/04/01/ Influenza A virus (A/California/04/2009(H1N1)) segment 6 neuraminidase (NA) gene, complete cds

Swine N2, EA, 25 sequences
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gi|14275696|gb|AJ293923| /Human/6 (NA)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) na gene for neuraminidase, genomic RNA
gi|13661033|gb|AJ311455| /Swine/6 (NA)/H3N2/Belgium/1992/// Influenza A virus NA gene for Neuraminidase, genomic RNA, strain A/Swine/Belgium/220/92
gi|20068244|gb|AJ412701| /Swine/6 (NA)/H1N2/Italy/1998/// Influenza A virus (A/swine/Italy/1521/98(H1N2)) partial NAN2 gene for neuraminidase, genomic RNA
gi|20068246|gb|AJ412702| /Swine/6 (NA)/H1N2/France/1999/// Influenza A virus (A/swine/Cotes d'Armor/604/99(H1N2)) NAN2 gene for neuraminidase, genomic RNA
gi|20068252|gb|AJ412705| /Swine/6 (NA)/H1N2/France/1997/// Influenza A virus (A/swine/Cotes d'Armor/790/97(H1N2)) NAN2 gene for neuraminidase, genomic RNA
gi|164511470|gb|AM746617| /Swine/6 (NA)/H3N2/Germany/2006/// Influenza A virus (A/wild boar/Germany/WS169/2006(H3N2)) N2 gene for neuraminidase, genomic RNA
gi|38154883|gb|AY363555| /Swine/6 (NA)/H3N2/Hong Kong/1999/// Influenza A virus (A/swine/Hong Kong/5190/99(H3N2)) neuraminidase (NA) gene, partial cds.
gi|38154887|gb|AY363557| /Swine/6 (NA)/H3N2/Hong Kong/1999/// Influenza A virus (A/swine/Hong Kong/5212/99(H3N2)) neuraminidase (NA) gene, partial cds.
gi|38154889|gb|AY363558| /Swine/6 (NA)/H3N2/Hong Kong/2000/// Influenza A virus (A/swine/Hong Kong/7982/00(H3N2)) neuraminidase (NA) gene, partial cds.
gi|38154891|gb|AY363559| /Swine/6 (NA)/H3N2/Hong Kong/2001/// Influenza A virus (A/swine/Hong Kong/9296/01(H3N2)) neuraminidase (NA) gene, partial cds.
gi|38154893|gb|AY363560| /Swine/6 (NA)/H3N2/Hong Kong/2001/// Influenza A virus (A/swine/Hong Kong/9745/01(H3N2)) neuraminidase (NA) gene, partial cds.
gi|38154895|gb|AY363561| /Swine/6 (NA)/H3N2/Hong Kong/2002/// Influenza A virus (A/swine/Hong Kong/1144/02(H3N2)) neuraminidase (NA) gene, partial cds.
gi|38154897|gb|AY363562| /Swine/6 (NA)/H3N2/Hong Kong/2002/// Influenza A virus (A/swine/Hong Kong/1197/02(H3N2)) neuraminidase (NA) gene, partial cds.
gi|89148257|gb|CY009374| /Swine/6 (NA)/H3N2/Spain/2001/// Influenza A virus (A/swine/Spain/33601/2001(H3N2)) segment 6, complete sequence
gi|89148100|gb|CY009382| /Swine/6 (NA)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/39139/2002(H3N2)) segment 6, complete sequence
gi|91177911|gb|CY010566| /Swine/6 (NA)/H3N2/Spain/2004/// Influenza A virus (A/swine/Spain/54008/2004(H3N2)) segment 6, complete sequence
gi|133981513|gb|CY020503| /Swine/6 (NA)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/42386/2002(H3N2)) segment 6, complete sequence
gi|117935802|gb|EF101743| /Human/6 (NA)/H1N2/Philippines/2004/02/24/ Influenza A virus (A/Philippines/344/2004(H1N2)) neuraminidase gene, partial cds
gi|148628617|gb|EF409252| /Swine/6 (NA)/H3N2/Germany/1982/// Influenza A virus (A/swine/Potsdam/35/82(H3N2)) neuraminidase (NA) gene, complete cds
gi|148628642|gb|EF409254| /Swine/6 (NA)/H3N2/Germany/1992/// Influenza A virus (A/swine/Leipzig/145/92(H3N2)) neuraminidase (NA) gene, complete cds
gi|148628679|gb|EF409256| /Swine/6 (NA)/H3N2/Germany/1996/// Influenza A virus (A/swine/Jena/5/96(H3N2)) neuraminidase (NA) gene, complete cds
gi|148628681|gb|EF409257| /Swine/6 (NA)/H3N2/Germany/1997/// Influenza A virus (A/swine/Lohne/1/97(H3N2)) neuraminidase (NA) gene, complete cds
gi|148628683|gb|EF409258| /Swine/6 (NA)/H3N2/Germany/1999/// Influenza A virus (A/swine/Bakum/8602/99(H3N2)) neuraminidase (NA) gene, complete cds

gi|153957955|gb|EU053135| /Swine/6 (NA)/H1N2/Germany/2005/12/07/ Influenza A virus (A/swine/Doetlingen/IDT4735/2005(H1N2)) segment 6 neuraminidase gene, complete cds.
gi|153958061|gb|EU053143| /Swine/6 (NA)/H1N2/Germany/2005/12/13/ Influenza A virus (A/swine/Cloppenburg/IDT4777/2005(H1N2)) segment 6 neuraminidase gene, complete cds.

Human and Swine N2, NA, 81 sequences

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gi|3722174|gb|AF038262| /Human/6 (NA)/H3N2/Japan/1996/// Influenza A virus H3N2 A/Niigata/137/96 neuraminidase (NA) gene, complete cds.
gi|5764326|gb|AF153237| /Swine/6 (NA)/H3N2/USA/1998/// Influenza A virus (A/Swine/Texas/4199-2/98 (H3N2)) neuraminidase gene, partial cds.
gi|5764328|gb|AF153238| /Swine/6 (NA)/H3N2/USA/1998/// Influenza A virus (A/Swine/Minnesota/9088-2/98 (H3N2)) neuraminidase gene, partial cds.
gi|8515427|gb|AF250126| /Swine/6 (NA)/H1N2/USA/1999/// Influenza A virus (A/Swine/Indiana/9K035/99 (H1N2)) neuraminidase (NA) gene, complete cds.
gi|9887131|gb|AF251404| /Swine/6 (NA)/H3N2/USA/1998/// Influenza A virus (A/Swine/Nebraska/209/98 (H3N2)) neuraminidase (NA) gene, complete cds.
gi|110734303|gb|AF251412| /Swine/6 (NA)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/533/99 (H3N2)) neuraminidase (NA) gene, complete cds.
gi|9887165|gb|AF251420| /Swine/6 (NA)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/569/99 (H3N2)) neuraminidase (NA) gene, complete cds.
gi|110734304|gb|AF251428| /Swine/6 (NA)/H3N2/USA/1999/// Influenza A virus (A/Swine/Minnesota/593/99 (H3N2)) neuraminidase (NA) gene, complete cds.
gi|19422108|gb|AF455691| /Swine/6 (NA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Ohio/891/01(H1N2)) neuraminidase (NA) gene, complete cds.
gi|19422110|gb|AF455692| /Swine/6 (NA)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/98225/01(H1N2)) neuraminidase (NA) gene, complete cds.
gi|19422112|gb|AF455693| /Swine/6 (NA)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/93523/01 (H1N2)) neuraminidase (NA) gene, complete cds.
gi|19422114|gb|AF455694| /Swine/6 (NA)/H1N2/USA/2000/// Influenza A virus (A/Swine/Minnesota/55551/00 (H1N2)) neuraminidase (NA) gene, complete cds
gi|19422116|gb|AF455695| /Swine/6 (NA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Iowa/930/01(H1N2)) neuraminidase (NA) gene, complete cds.
gi|19422118|gb|AF455696| /Swine/6 (NA)/H1N2/USA/2000/// Influenza A virus (A/Swine/Indiana/P12439/00 (H1N2)) neuraminidase (NA) gene, complete cds.
gi|19422120|gb|AF455697| /Swine/6 (NA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100085A/01 (H1N2)) neuraminidase (NA) gene, complete cds.
gi|19422122|gb|AF455698| /Swine/6 (NA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100084/01 (H1N2)) neuraminidase (NA) gene, complete cds.
gi|19848289|gb|AY038015| /Avian/6 (NA)/H1N2/USA/1999/// Influenza A virus (A/Turkey/MO/24093/99(H1N2)) neuraminidase (N2) gene, complete cds.
gi|24286064|gb|AY129157| /Swine/6 (NA)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) neuraminidase (NA) mRNA, complete cds
gi|30522963|gb|AY233391| /Avian/6 (NA)/H1N2/USA/2001/// Influenza A virus (A/duck/NC/91347/01(H1N2)) neuraminidase (NA) gene, complete cds
gi|91127731|gb|CY010654| /Human/6 (NA)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/611/1995(H3N2)) segment 6, complete sequence
gi|91127765|gb|CY010662| /Human/6 (NA)/H3N2/USA/1995/12/19/ Influenza A virus (A/New York/612/1995(H3N2)) segment 6, complete sequence
gi|106896314|gb|CY010670| /Human/6 (NA)/H3N2/USA/1996/01/10/ Influenza A virus (A/New York/613/1996(H3N2)) segment 6, complete sequence
gi|109675452|gb|CY010678| /Human/6 (NA)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/618/1995(H3N2)) segment 6, complete sequence

gi|91129959|gb|CY010710| /Human/6 (NA)/H3N2/USA/1995/12/12/ Influenza A virus (A/New York/628/1995(H3N2)) segment 6, complete sequence
gi|131052319|gb|CY010726| /Human/6 (NA)/H3N2/USA/1995/12/08/ Influenza A virus (A/New York/634/1995(H3N2)) segment 6, complete sequence
gi|94959632|gb|CY010814| /Human/6 (NA)/H3N2/USA/1995/12/29/ Influenza A virus (A/New York/623/1995(H3N2)) segment 6, complete sequence
gi|109675460|gb|CY011434| /Human/6 (NA)/H3N2/USA/1996/02/16/ Influenza A virus (A/New York/624/1996(H3N2)) segment 6, complete sequence
gi|109675498|gb|CY011450| /Human/6 (NA)/H3N2/USA/1996/01/18/ Influenza A virus (A/New York/635/1996(H3N2)) segment 6, complete sequence
gi|109675536|gb|CY011466| /Human/6 (NA)/H3N2/USA/1996/01/03/ Influenza A virus (A/New York/641/1996(H3N2)) segment 6, complete sequence
gi|109914691|gb|CY011890| /Human/6 (NA)/H3N2/USA/1994/01/17/ Influenza A virus (A/New York/716/1994(H3N2)) segment 6, complete sequence
gi|110333423|gb|CY012218| /Human/6 (NA)/H3N2/USA/1995/12/18/ Influenza A virus (A/New York/639/1995(H3N2)) segment 6, complete sequence
gi|110629733|gb|CY012746| /Human/6 (NA)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/771/1993(H3N2)) segment 6, complete sequence
gi|110629771|gb|CY012762| /Human/6 (NA)/H3N2/USA/1993/03/20/ Influenza A virus (A/New York/777/1993(H3N2)) segment 6, complete sequence
gi|110733711|gb|CY012970| /Human/6 (NA)/H3N2/USA/1994/01/14/ Influenza A virus (A/New York/735/1994(H3N2)) segment 6, complete sequence
gi|112789112|gb|CY013679| /Human/6 (NA)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/784/1993(H3N2)) segment 6, complete sequence
gi|112789169|gb|CY013703| /Human/6 (NA)/H3N2/USA/1993/04/05/ Influenza A virus (A/New York/789/1993(H3N2)) segment 6, complete sequence
gi|112789321|gb|CY013767| /Human/6 (NA)/H3N2/USA/1993/03/10/ Influenza A virus (A/New York/799/1993(H3N2)) segment 6, complete sequence
gi|115521545|gb|CY016485| /Human/6 (NA)/H3N2/USA/1993/03/11/ Influenza A virus (A/New York/800/1993(H3N2)) segment 6, complete sequence
gi|84626339|gb|DQ335773| /Avian/6 (NA)/H3N2/USA/2004/// Influenza A virus (A/turkey/Ohio/313053/04(H3N2)) neuraminidase (NA) gene, complete cds
gi|94404613|gb|DQ469960| /Human/6 (NA)/H3N2/Canada/2005/// Influenza A virus (A/Ontario/RV1273/2005(H3N2)) neuraminidase (NA) gene, complete cds
gi|94404615|gb|DQ469968| /Swine/6 (NA)/H3N2/Canada/2005/// Influenza A virus (A/swine/Alberta/14722/2005(H3N2)) neuraminidase (NA) gene, complete cds
gi|94404617|gb|DQ469976| /Swine/6 (NA)/H3N2/Canada/2005/// Influenza A virus (A/swine/British Columbia/28103/2005(H3N2)) neuraminidase (NA) gene, complete cds
gi|94404619|gb|DQ469984| /Swine/6 (NA)/H3N2/Canada/2005/// Influenza A virus (A/swine/Manitoba/12707/2005(H3N2)) neuraminidase (NA) gene, complete cds
gi|94404621|gb|DQ469992| /Swine/6 (NA)/H3N2/Canada/2005/// Influenza A virus (A/swine/Ontario/33853/2005(H3N2)) neuraminidase (NA) gene, complete cds
gi|94404623|gb|DQ470000| /Avian/6 (NA)/H3N2/Canada/2005/// Influenza A virus (A/turkey/Ontario/31232/2005(H3N2)) neuraminidase (NA) gene, complete cds
gi|109501339|gb|DQ666935| /Swine/6 (NA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/S11/2005(H1N2)) segment 6 neuraminidase gene, complete cds.
gi|146454451|gb|EF551047| /Avian/6 (NA)/H3N2/USA/2004/// Influenza A virus (A/turkey/Illinois/2004(H3N2)) segment 6 neuraminidase (NA) gene, complete cds.
gi|146454469|gb|EF551055| /Swine/6 (NA)/H3N2/USA/2003/// Influenza A virus (A/swine/North Carolina/2003(H3N2)) segment 6 neuraminidase (NA) gene, complete cds.
gi|146706474|gb|EF556200| /Swine/6 (NA)/H1N2/China/2006/// Influenza A virus (A/swine/Guangxi/13/2006(H1N2)) neuraminidase (NA) gene, complete cds.
gi|146706501|gb|EF556202| /Swine/6 (NA)/H1N2/China/2005/// Influenza A virus (A/swine/Guangxi/17/2005(H1N2)) neuraminidase (NA) gene, complete cds.

gi|146706526|gb|EF556204| /Swine/6 (NA)/H1N2/China/2005/// Influenza A virus (A/swine/Hainan/1/2005(H1N2)) neuraminidase (NA) gene, complete cds.
gi|157168469|gb|EU139838| /Swine/6 (NA)/H1N2/USA/2001/// Influenza A virus (A/swine/Minnesota/1192/2001(H1N2)) neuraminidase (NA) gene, partial cds
gi|157168473|gb|EU139840| /Swine/6 (NA)/H1N2/USA/2003/// Influenza A virus (A/swine/Minnesota/00194/2003(H1N2)) neuraminidase (NA) gene, partial cds
gi|157168475|gb|EU139841| /Swine/6 (NA)/H1N2/USA/2004/// Influenza A virus (A/swine/Kansas/00246/2004(H1N2)) neuraminidase (NA) gene, partial cds
gi|167996848|gb|EU301273| /Swine/6 (NA)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|187763983|gb|EU697206| /Avian/6 (NA)/H3N2/USA/2005/// Influenza A virus (A/turkey/Minnesota/366767/2005(H3N2)) neuraminidase (NA) gene, complete cds
gi|189313124|gb|EU735820| /Avian/6 (NA)/H3N2/USA/2004/// Influenza A virus (A/turkey/OH/313053/2004(H3N2)) neuraminidase (NA) gene, complete cds
gi|189313105|gb|EU735828| /Avian/6 (NA)/H3N2/USA/2005/// Influenza A virus (A/turkey/NC/353568/2005(H3N2)) neuraminidase (NA) gene, complete cds
gi|193877760|gb|EU743212| /Avian/6 (NA)/H3N2/USA/2005/// Influenza A virus (A/turkey/MN/366767/2005(H3N2)) segment 6 neuraminidase (NA) gene, complete cds.
gi|190403803|gb|EU798820| /Swine/6 (NA)/H1N2/South Korea/2004/// Influenza A virus (A/swine/Korea/Hongsong2/2004(H1N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403805|gb|EU798821| /Swine/6 (NA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL01/2005(H1N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403807|gb|EU798822| /Swine/6 (NA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL02/2005(H1N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403809|gb|EU798823| /Swine/6 (NA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL04/2005(H1N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403811|gb|EU798824| /Swine/6 (NA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/Asan04/2006(H1N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403813|gb|EU798825| /Swine/6 (NA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ4/2006(H1N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403815|gb|EU798826| /Swine/6 (NA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ7/2006(H1N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403817|gb|EU798827| /Swine/6 (NA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ14/2006(H1N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403819|gb|EU798828| /Swine/6 (NA)/H1N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY08/2007(H1N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403821|gb|EU798829| /Swine/6 (NA)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/CAS05/2004(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403823|gb|EU798830| /Swine/6 (NA)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAN04/2005(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403825|gb|EU798831| /Swine/6 (NA)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS07/2005(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403827|gb|EU798832| /Swine/6 (NA)/H3N2/South Korea/2006/// Influenza A virus (A/swine/Korea/CAS09/2006(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403829|gb|EU798833| /Swine/6 (NA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY04/2007(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403831|gb|EU798834| /Swine/6 (NA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY05/2007(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403833|gb|EU798835| /Swine/6 (NA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY07/2007(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403835|gb|EU798836| /Swine/6 (NA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY09/2007(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|190403837|gb|EU798837| /Swine/6 (NA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY10/2007(H3N2)) segment 6 neuraminidase (NA) gene, complete cds

gi|192382741|gb|EU826544| /Swine/6 (NA)/H3N2/Canada/2005/07/12/ Influenza A virus (A/swine/Quebec/4001/2005(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|209486611|gb|FJ374514| /Swine/6 (NA)/H1N2/China/2007/03/24/ Influenza A virus (A/swine/Shanghai/1/2007(H1N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|3721971|gb|U71142| /Human/6 (NA)/H3N2/Japan/1995/// Influenza A virus H3N2 A/Shiga/20/95 neuraminidase (NA) gene, complete cds.
gi|3721973|gb|U71143| /Human/6 (NA)/H3N2/Japan/1995/// Influenza A virus H3N2 A/Miyagi/29/95 neuraminidase (NA) gene, complete cds.

Swine and Human N1'2, EA, 27 sequences
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gi|4585174|gb|AF091316| /Swine/4 (HA)/H1N1/Belgium/1983/// Influenza A virus (A/swine/Belgium/1/83(H1N1)) segment 4 hemagglutinin precursor (HA) mRNA, complete cds.
gi|14275690|gb|AJ293920| /Human/1 (PB2)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) pb2 gene for polymerase subunit 2, genomic RNA
gi|14275694|gb|AJ293922| /Human/3 (PA)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) pa gene for polymerase A, genomic RNA
gi|14275698|gb|AJ293924| /Human/5 (NP)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) np gene for nucleoprotein, genomic RNA
gi|14275703|gb|AJ293926| /Human/4 (HA)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) partial ha gene for haemagglutinin, genomic RNA
gi|20068042|gb|AJ307065| /Swine/5 (NP)/H1N2/France/1997/// Influenza A virus (A/swine/Cotes d'Armor/790/97(H1N2)) NP gene for nucleoprotein, genomic RNA
gi|20068046|gb|AJ307067| /Swine/5 (NP)/H1N2/Italy/1998/// Influenza A virus (A/swine/Italy/1521/98(H1N2)) NP gene for nucleoprotein, genomic RNA
gi|20068060|gb|AJ307074| /Swine/5 (NP)/H1N2/France/1999/// Influenza A virus (A/swine/Cotes d'Armor/604/99(H1N2)) NP gene for nucleoprotein, genomic RNA
gi|20068068|gb|AJ311206| /Swine/3 (PA)/H1N2/Italy/1998/// Influenza A virus (A/swine/Italy/1521/98(H1N2)) partial PA gene for polymerase subunit, genomic RNA
gi|20068070|gb|AJ311207| /Swine/3 (PA)/H1N2/France/1997/// Influenza A virus (A/swine/Cotes d'Armor/790/97(H1N2)) partial PA gene for polymerase subunit, genomic RNA
gi|13661047|gb|AJ311462| /Swine/2 (PB1)/H1N1/France/1982/// Influenza A virus PB1 gene for Polymerase 1 protein, genomic RNA, strain A/Swine/Finistere/2899/82
gi|13661049|gb|AJ311463| /Swine/3 (PA)/H1N1/France/1982/// Influenza A virus PA gene for Polymerase A protein, genomic RNA, strain A/Swine/Finistere/2899/82
gi|20068083|gb|AJ312836| /Swine/3 (PA)/H1N1/France/1999/// Influenza A virus (A/swine/Ile et Vilaine/1455/99(H1N1)) PA gene for polymerase subunit, genomic RNA
gi|20068087|gb|AJ312838| /Swine/3 (PA)/H1N2/France/1999/// Influenza A virus (A/swine/Cotes d'Armor/604/99(H1N2)) PA gene for polymerase subunit, genomic RNA
gi|18074896|gb|AJ410542| /Avian/4 (HA)/H6N1/Hong Kong/1977/// Influenza A virus genomic RNA for haemagglutinin (ha gene) strain A/duck/Hong Kong/175/77 (H6N1)
gi|18074900|gb|AJ410544| /Avian/4 (HA)/H6N1/Hong Kong/1977/// Influenza A virus genomic RNA for haemagglutinin (ha gene) strain A/duck/Hong Kong/202/77 (H6N1)
gi|164511468|gb|AM746616| /Swine/4 (HA)/H3N2/Germany/2006/// Influenza A virus (A/wild boar/Germany/WS169/2006(H3N2)) H3 gene for hemagglutinin, genomic RNA
gi|164511474|gb|AM746619| /Swine/5 (NP)/H3N2/Germany/2006/// Influenza A virus (A/wild boar/Germany/WS169/2006(H3N2)) NP gene for nucleoprotein, genomic RNA
gi|24286062|gb|AY129156| /Swine/4 (HA)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) hemagglutinin (HA) mRNA, complete cds
gi|24286069|gb|AY129159| /Swine/5 (NP)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) nucleoprotein (NP) mRNA, complete cds
gi|24286087|gb|AY129161| /Swine/3 (PA)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) polymerase acidic protein 2 (PA) mRNA, complete cds

gi|24286096|gb|AY129162| /Swine/2 (PB1)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) polymerase subunit 1 (PB1) mRNA, complete cds
gi|24286100|gb|AY129163| /Swine/1 (PB2)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) polymerase subunit 2 (PB2) mRNA, complete cds
gi|325088|gb|M76608| /Swine/5 (NP)/H1N1/USA/1988/// Influenza A virus (A/swine/Wisconsin/1915/1988(H1N1)) nucleoprotein mRNA, complete cds.
gi|1912380|gb|U49091| /Swine/5 (NP)/H1N1/China/1991/// Influenza A virus (A/swine/Beijing/94/1991(H1N1)) nucleoprotein (NP) mRNA, complete cds.
gi|1399602|gb|U53162| /Human/4 (HA)/H1N1/USA/1994/// Influenza A virus (A/WI/4754/1994(H1N1)) hemagglutinin (HA) mRNA, complete cds
gi|1399604|gb|U53163| /Human/4 (HA)/H1N1/USA/1994/// Influenza A virus (A/WI/4755/1994(H1N1)) hemagglutinin (HA) mRNA, complete cds

Swine H1N1, NA, 19 sequences

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gi|149785321|gb|CY022324| /Swine/1 (PB2)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/1/1985(H1N1)) segment 1, complete sequence
gi|149785272|gb|CY022332| /Swine/1 (PB2)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/3/1985(H1N1)) segment 1, complete sequence
gi|149785199|gb|CY022340| /Swine/1 (PB2)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/17672/1988(H1N1)) segment 1, complete sequence
gi|149785141|gb|CY022436| /Swine/1 (PB2)/H1N1/USA/1988/// Influenza A virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 1, complete sequence
gi|149785068|gb|CY022476| /Swine/1 (PB2)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3228/1987(H1N1)) segment 1, complete sequence
gi|149784988|gb|CY022484| /Swine/1 (PB2)/H1N1/USA/1991/// Influenza A virus (A/swine/Maryland/23239/1991(H1N1)) segment 1, complete sequence
gi|152963544|gb|CY022977| /Swine/1 (PB2)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/31483/1988(H1N1)) segment 1, complete sequence
gi|156536574|gb|CY024932| /Human/1 (PB2)/H1N1/USA/1988/// Influenza A virus (A/Ohio/3559/1988(H1N1)) segment 1, complete sequence
gi|156536610|gb|CY025017| /Swine/1 (PB2)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3024/1987(H1N1)) segment 1, complete sequence
gi|158525311|gb|CY027162| /Swine/1 (PB2)/H1N1/USA/1991/// Influenza A virus (A/swine/Iowa/24297/1991(H1N1)) segment 1, complete sequence
gi|158958073|gb|CY027514| /Swine/1 (PB2)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/2/1985(H1N1)) segment 1, complete sequence
gi|166203504|gb|CY028787| /Swine/1 (PB2)/H1N1/USA/1991/// Influenza A virus (A/swine/California/T9001707/1991(H1N1)) segment 1, complete sequence
gi|208400894|gb|CY035077| /Swine/1 (PB2)/H1N1/USA/1990/// Influenza A virus (A/swine/Memphis/1/1990(H1N1)) segment 1, complete sequence
gi|229807668|gb|CY039924| /Swine/1 (PB2)/H1N1/USA/1988/// Influenza A Virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 1, complete sequence
gi|229809528|gb|CY039932| /Swine/1 (PB2)/H1N1/USA/1988/// Influenza A Virus (A/swine/Indiana/1726/1988(H1N1)) segment 1, complete sequence
gi|189313211|gb|EU735793| /Avian/1 (PB2)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/19762/1988(H1N1)) polymerase PB2 (PB2) gene, complete cds.
gi|193877866|gb|EU743158| /Avian/1 (PB2)/H1N1/USA/1990/// Influenza A virus (A/turkey/IA/10271-3/1990(H1N1)) segment 1 polymerase PB2 (PB2) gene, complete cds.
gi|193877848|gb|EU743166| /Avian/1 (PB2)/H1N1/USA/1992/// Influenza A virus (A/turkey/IA/21089-3/1992(H1N1)) segment 1 polymerase PB2 (PB2) gene, complete cds.
gi|209164833|gb|FJ357111| /Avian/1 (PB2)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/17026/1988(H1N1)) segment 1 polymerase PB2 (PB2) gene, complete cds

Human H3N2, 22 sequences

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gi|3722112|gb|AF037415| /Human/1 (PB2)/H3N2/Japan/1996/// Influenza A virus H3N2 A/Niigata/137/96 PB2 polymerase subunit (PB2) gene, complete cds.
gi|91127743|gb|CY010659| /Human/1 (PB2)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/611/1995(H3N2)) segment 1, complete sequence
gi|91127809|gb|CY010667| /Human/1 (PB2)/H3N2/USA/1995/12/19/ Influenza A virus (A/New York/612/1995(H3N2)) segment 1, complete sequence
gi|91128216|gb|CY010675| /Human/1 (PB2)/H3N2/USA/1996/01/10/ Influenza A virus (A/New York/613/1996(H3N2)) segment 1, complete sequence

gi|91128597|gb|CY010683| /Human/1 (PB2)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/618/1995(H3N2)) segment 1, complete sequence
gi|91130009|gb|CY010715| /Human/1 (PB2)/H3N2/USA/1995/12/12/ Influenza A virus (A/New York/628/1995(H3N2)) segment 1, complete sequence
gi|91130772|gb|CY010731| /Human/1 (PB2)/H3N2/USA/1995/12/08/ Influenza A virus (A/New York/634/1995(H3N2)) segment 1, complete sequence
gi|94959644|gb|CY010819| /Human/1 (PB2)/H3N2/USA/1995/12/29/ Influenza A virus (A/New York/623/1995(H3N2)) segment 1, complete sequence
gi|109675472|gb|CY011439| /Human/1 (PB2)/H3N2/USA/1996/02/16/ Influenza A virus (A/New York/624/1996(H3N2)) segment 1, complete sequence
gi|109675510|gb|CY011455| /Human/1 (PB2)/H3N2/USA/1996/01/18/ Influenza A virus (A/New York/635/1996(H3N2)) segment 1, complete sequence
gi|109675548|gb|CY011471| /Human/1 (PB2)/H3N2/USA/1996/01/03/ Influenza A virus (A/New York/641/1996(H3N2)) segment 1, complete sequence
gi|109914703|gb|CY011895| /Human/1 (PB2)/H3N2/USA/1994/01/17/ Influenza A virus (A/New York/716/1994(H3N2)) segment 1, complete sequence
gi|110333435|gb|CY012223| /Human/1 (PB2)/H3N2/USA/1995/12/18/ Influenza A virus (A/New York/639/1995(H3N2)) segment 1, complete sequence
gi|110629745|gb|CY012751| /Human/1 (PB2)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/771/1993(H3N2)) segment 1, complete sequence
gi|110629783|gb|CY012767| /Human/1 (PB2)/H3N2/USA/1993/03/20/ Influenza A virus (A/New York/777/1993(H3N2)) segment 1, complete sequence
gi|110733723|gb|CY012975| /Human/1 (PB2)/H3N2/USA/1994/01/14/ Influenza A virus (A/New York/735/1994(H3N2)) segment 1, complete sequence
gi|112789124|gb|CY013684| /Human/1 (PB2)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/784/1993(H3N2)) segment 1, complete sequence
gi|112789181|gb|CY013708| /Human/1 (PB2)/H3N2/USA/1993/04/05/ Influenza A virus (A/New York/789/1993(H3N2)) segment 1, complete sequence
gi|112789333|gb|CY013772| /Human/1 (PB2)/H3N2/USA/1993/03/10/ Influenza A virus (A/New York/799/1993(H3N2)) segment 1, complete sequence
gi|115521557|gb|CY016490| /Human/1 (PB2)/H3N2/USA/1993/03/11/ Influenza A virus (A/New York/800/1993(H3N2)) segment 1, complete sequence
gi|3721955|gb|U71134| /Human/1 (PB2)/H3N2/Japan/1995/// Influenza A virus H3N2 A/Shiga/20/95 PB2 polymerase subunit (PB2) gene, complete cds.
gi|3721957|gb|U71135| /Human/1 (PB2)/H3N2/Japan/1995/// Influenza A virus H3N2 A/Miyagi/29/95 PB2 polymerase subunit (PB2) gene, complete cds.

Swine, EA, 20 sequences
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gi|216409279|gb|AB434317| /Swine/1 (PB2)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/NIAH589/2005(H1N1)) PB2 gene for polymerase PB2, complete cds
gi|216409297|gb|AB434325| /Swine/1 (PB2)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chachoengsao/NIAH587/2005(H1N1)) PB2 gene for polymerase PB2, complete cds
gi|14275690|gb|AJ293920| /Human/1 (PB2)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) pb2 gene for polymerase subunit 2, genomic RNA
gi|78097322|gb|CY005500| /Avian/1 (PB2)/H7N1/China/1992/// Influenza A virus (A/duck/Nanchang/1904/1992(H7N1)) segment 1, complete sequence
gi|78097610|gb|CY005612| /Avian/1 (PB2)/H6N1/Hong Kong/1977/// Influenza A virus (A/chicken/Hong Kong/17/1977(H6N1)) segment 1, complete sequence
gi|89148268|gb|CY009379| /Swine/1 (PB2)/H3N2/Spain/2001/// Influenza A virus (A/swine/Spain/33601/2001(H3N2)) segment 1, complete sequence
gi|89148111|gb|CY009387| /Swine/1 (PB2)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/39139/2002(H3N2)) segment 1, complete sequence

gi|89789297|gb|CY009899| /Swine/1 (PB2)/H1N1/Spain/2003/// Influenza A virus (A/Swine/Spain/50047/2003(H1N1)) segment 1, complete sequence
gi|91177923|gb|CY010571| /Swine/1 (PB2)/H3N2/Spain/2004/// Influenza A virus (A/swine/Spain/54008/2004(H3N2)) segment 1, complete sequence
gi|91125711|gb|CY010579| /Swine/1 (PB2)/H1N1/Spain/2003/// Influenza A virus (A/swine/Spain/51915/2003(H1N1)) segment 1, complete sequence
gi|91177904|gb|CY010587| /Swine/1 (PB2)/H1N1/Spain/2004/// Influenza A virus (A/swine/Spain/53207/2004(H1N1)) segment 1, complete sequence
gi|133981572|gb|CY020508| /Swine/1 (PB2)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/42386/2002(H3N2)) segment 1, complete sequence
gi|85692708|gb|DQ351870| /Avian/1 (PB2)/H5N1/China/2001/// Influenza A virus (A/chicken/Hebei/718/2001(H5N1)) segment 1 polymerase basic protein 2 (PB2) gene, complete cds.
gi|118136498|gb|EF101754| /Human/1 (PB2)/H1N1/Thailand/2005/07/14/ Influenza A virus (A/Thailand/271/2005(H1N1)) polymerase PB2 gene, partial cds
gi|153957895|gb|EU053130| /Swine/1 (PB2)/H1N2/Germany/2005/12/07/ Influenza A virus (A/swine/Doetlingen/IDT4735/2005(H1N2)) segment 1 polymerase subunit PB2 gene, complete cds.
gi|153957995|gb|EU053138| /Swine/1 (PB2)/H1N2/Germany/2005/12/13/ Influenza A virus (A/swine/Cloppenburg/IDT4777/2005(H1N2)) segment 1 polymerase subunit PB2 gene, complete cds.
gi|192382755|gb|EU826550| /Swine/1 (PB2)/H3N2/Canada/2005/07/12/ Influenza A virus (A/swine/Quebec/4001/2005(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|210076648|gb|FJ415615| /Swine/1 (PB2)/H1N1/China/2007/11/15/ Influenza A virus (A/swine/Zhejiang/1/2007(H1N1)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|211996969|gb|FJ432785| /Avian/1 (PB2)/H1N1/Italy/2003/// Influenza A virus (A/goose/Italy/296426/2003(H1N1)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|324989|gb|M55471| /Swine/1 (PB2)/H1N1/Germany/1981/// Influenza A virus (A/swine/Germany/2/1981(H1N1)) polymerase gene, complete cds.

Swine, NA, 59 sequences
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gi|8515438|gb|AF250131| /Swine/1 (PB2)/H1N2/USA/1999/// Influenza A virus (A/Swine/Indiana/9K035/99 (H1N2)) polymerase subunit PB2 (PB2) gene, complete cds.
gi|9887144|gb|AF251410| /Swine/1 (PB2)/H3N2/USA/1998/// Influenza A virus (A/Swine/Nebraska/209/98 (H3N2)) PB2 polymerase subunit (PB2) gene, complete cds.
gi|9887161|gb|AF251418| /Swine/1 (PB2)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/533/99 (H3N2)) PB2 polymerase subunit (PB2) gene, complete cds.
gi|9887178|gb|AF251426| /Swine/1 (PB2)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/569/99 (H3N2)) PB2 polymerase subunit (PB2) gene, complete cds.
gi|9887195|gb|AF251434| /Swine/1 (PB2)/H3N2/USA/1999/// Influenza A virus (A/Swine/Minnesota/593/99 (H3N2)) PB2 polymerase subunit (PB2) gene, complete cds.
gi|19422196|gb|AF455731| /Swine/1 (PB2)/H1N2/USA/2001/// Influenza A virus (A/Swine/Ohio/891/01(H1N2)) polymerase subunit (PB2) gene, complete cds.
gi|19422198|gb|AF455732| /Swine/1 (PB2)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/98225/01(H1N2)) polymerase subunit (PB2) gene, complete cds.
gi|19422200|gb|AF455733| /Swine/1 (PB2)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/93523/01 (H1N2)) polymerase subunit (PB2) gene, complete cds.
gi|19422202|gb|AF455734| /Swine/1 (PB2)/H1N2/USA/2000/// Influenza A virus (A/Swine/Minnesota/55551/00 (H1N2)) polymerase subunit (PB2) gene, complete cds
gi|19422204|gb|AF455735| /Swine/1 (PB2)/H1N2/USA/2001/// Influenza A virus (A/Swine/Iowa/930/01(H1N2)) polymerase subunit (PB2) gene, complete cds.
gi|19422206|gb|AF455736| /Swine/1 (PB2)/H1N2/USA/2000/// Influenza A virus (A/Swine/Indiana/P12439/00 (H1N2)) polymerase subunit (PB2) gene, complete cds.
gi|19422208|gb|AF455737| /Swine/1 (PB2)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100085A/01 (H1N2)) polymerase subunit (PB2) gene, complete cds.

gi|19422210|gb|AF455738| /Swine/1 (PB2)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100084/01 (H1N2)) polymerase subunit (PB2) gene, complete cds.
gi|24286100|gb|AY129163| /Swine/1 (PB2)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) polymerase subunit 2 (PB2) mRNA, complete cds
gi|30522954|gb|AY233387| /Avian/1 (PB2)/H1N2/USA/2001/// Influenza A virus (A/duck/NC/91347/01(H1N2)) polymerase subunit PB2 (PB2) gene, complete cds
gi|76574379|gb|DQ145540| /Swine/1 (PB2)/H3N1/USA/2004/// Influenza A virus (A/swine/Minnesota/00395/2004(H3N1)) PB2 gene, complete cds
gi|75756543|gb|DQ150422| /Swine/1 (PB2)/H3N1/USA/2004/// Influenza A virus (A/swine/MI/PU243/04 (H3N1)) polymerase (PB2) gene, complete cds.
gi|75756559|gb|DQ150430| /Swine/1 (PB2)/H3N1/USA/2004/// Influenza A virus (A/swine/IN/PU542/04 (H3N1)) polymerase (PB2) gene, complete cds.
gi|84626349|gb|DQ335778| /Avian/1 (PB2)/H3N2/USA/2004/// Influenza A virus (A/turkey/Ohio/313053/04(H3N2)) polymerase PB2 (PB2) gene, complete cds
gi|94404667|gb|DQ469955| /Human/1 (PB2)/H3N2/Canada/2005/// Influenza A virus (A/Ontario/RV1273/2005(H3N2)) polymerase subunit PB2 (PB2) gene, complete cds
gi|94404669|gb|DQ469963| /Swine/1 (PB2)/H3N2/Canada/2005/// Influenza A virus (A/swine/Alberta/14722/2005(H3N2)) polymerase subunit PB2 (PB2) gene, complete cds
gi|94404671|gb|DQ469971| /Swine/1 (PB2)/H3N2/Canada/2005/// Influenza A virus (A/swine/British Columbia/28103/2005(H3N2)) polymerase subunit PB2 (PB2) gene, complete cds
gi|94404673|gb|DQ469979| /Swine/1 (PB2)/H3N2/Canada/2005/// Influenza A virus (A/swine/Manitoba/12707/2005(H3N2)) polymerase subunit PB2 (PB2) gene, complete cds
gi|94404675|gb|DQ469987| /Swine/1 (PB2)/H3N2/Canada/2005/// Influenza A virus (A/swine/Ontario/33853/2005(H3N2)) polymerase subunit PB2 (PB2) gene, complete cds
gi|94404677|gb|DQ469995| /Avian/1 (PB2)/H3N2/Canada/2005/// Influenza A virus (A/turkey/Ontario/31232/2005(H3N2)) polymerase subunit PB2 (PB2) gene, complete cds
gi|112456162|gb|DQ889682| /Human/1 (PB2)/H1N1/USA/2005/// Influenza A virus (A/Iowa/CEID23/2005(H1N1)) polymerase PB2 (PB2) gene, complete cds
gi|114215324|gb|DQ923520| /Swine/1 (PB2)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ72-1/2006(H3N1)) polymerase basic protein 2 (PB2) gene, complete cds
gi|114215326|gb|DQ923521| /Swine/1 (PB2)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/CN22/2006(H3N1)) polymerase basic protein 2 (PB2) gene, complete cds
gi|146454441|gb|EF551042| /Avian/1 (PB2)/H3N2/USA/2004/// Influenza A virus (A/turkey/Illinois/2004(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds.
gi|146454459|gb|EF551050| /Swine/1 (PB2)/H3N2/USA/2003/// Influenza A virus (A/swine/North Carolina/2003(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds.
gi|151175886|gb|EU015993| /Swine/1 (PB2)/H1N2/China/2006/// Influenza A virus (A/swine/Guangxi/13/2006(H1N2)) polymerase basic protein 2 (PB2) gene, complete cds.
gi|156254991|gb|EU084946| /Avian/1 (PB2)/H5N2/USA/1998/// Influenza A virus (A/chukar/MN/14591-7/1998(H5N2)), complete sequence
gi|198387443|gb|EU301177| /Swine/1 (PB2)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) polymerase PB2 (PB2) gene, complete cds
gi|188572603|gb|EU409953| /Swine/1 (PB2)/H1N1/USA/2004/// Influenza A virus (A/swine/Ohio/75004/04(H1N1)) polymerase PB2 (PB2) gene, complete cds
gi|189313136|gb|EU735825| /Avian/1 (PB2)/H3N2/USA/2004/// Influenza A virus (A/turkey/OH/313053/2004(H3N2)) polymerase PB2 (PB2) gene, complete cds
gi|189313117|gb|EU735833| /Avian/1 (PB2)/H3N2/USA/2005/// Influenza A virus (A/turkey/NC/353568/2005(H3N2)) polymerase PB2 (PB2) gene, complete cds
gi|193877748|gb|EU743217| /Avian/1 (PB2)/H3N2/USA/2005/// Influenza A virus (A/turkey/MN/366767/2005(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds.
gi|190404038|gb|EU798918| /Swine/1 (PB2)/H1N1/South Korea/2004/// Influenza A virus (A/swine/Korea/CAN01/2004(H1N1)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404040|gb|EU798919| /Swine/1 (PB2)/H1N1/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS08/2005(H1N1)) segment 1 polymerase PB2 (PB2) gene, complete cds

gi|190404042|gb|EU798920| /Swine/1 (PB2)/H1N2/South Korea/2004/// Influenza A virus (A/swine/Korea/Hongsong2/2004(H1N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404044|gb|EU798921| /Swine/1 (PB2)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL01/2005(H1N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404046|gb|EU798922| /Swine/1 (PB2)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL02/2005(H1N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404048|gb|EU798923| /Swine/1 (PB2)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL04/2005(H1N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404050|gb|EU798924| /Swine/1 (PB2)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/Asan04/2006(H1N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404052|gb|EU798925| /Swine/1 (PB2)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ4/2006(H1N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404054|gb|EU798926| /Swine/1 (PB2)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ7/2006(H1N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404056|gb|EU798927| /Swine/1 (PB2)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ14/2006(H1N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404058|gb|EU798928| /Swine/1 (PB2)/H1N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY08/2007(H1N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404060|gb|EU798929| /Swine/1 (PB2)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/CAS05/2004(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404062|gb|EU798930| /Swine/1 (PB2)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAN04/2005(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404064|gb|EU798931| /Swine/1 (PB2)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS07/2005(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404066|gb|EU798932| /Swine/1 (PB2)/H3N2/South Korea/2006/// Influenza A virus (A/swine/Korea/CAS09/2006(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404068|gb|EU798933| /Swine/1 (PB2)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY04/2007(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404070|gb|EU798934| /Swine/1 (PB2)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY05/2007(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404072|gb|EU798935| /Swine/1 (PB2)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY07/2007(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404074|gb|EU798936| /Swine/1 (PB2)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY09/2007(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|190404076|gb|EU798937| /Swine/1 (PB2)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY10/2007(H3N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|209486606|gb|FJ374512| /Swine/1 (PB2)/H1N2/China/2007/03/24/ Influenza A virus (A/swine/Shanghai/1/2007(H1N2)) segment 1 polymerase PB2 (PB2) gene, complete cds
gi|227809823|gb|FJ966079| /Human/1 (PB2)/H1N1/USA/2009/04/01/ Influenza A virus (A/California/04/2009(H1N1)) segment 1 polymerase PB2 (PB2) gene, complete cds

Swine H1N1, NA, 20 sequences

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gi|149785318|gb|CY022323| /Swine/2 (PB1)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/1/1985(H1N1)) segment 2, complete sequence
gi|149785269|gb|CY022331| /Swine/2 (PB1)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/3/1985(H1N1)) segment 2, complete sequence
gi|149785197|gb|CY022339| /Swine/2 (PB1)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/17672/1988(H1N1)) segment 2, complete sequence
gi|149785138|gb|CY022435| /Swine/2 (PB1)/H1N1/USA/1988/// Influenza A virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 2, complete sequence
gi|149785066|gb|CY022475| /Swine/2 (PB1)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3228/1987(H1N1)) segment 2, complete sequence
gi|149784985|gb|CY022483| /Swine/2 (PB1)/H1N1/USA/1991/// Influenza A virus (A/swine/Maryland/23239/1991(H1N1)) segment 2, complete sequence
gi|152963542|gb|CY022976| /Swine/2 (PB1)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/31483/1988(H1N1)) segment 2, complete sequence
gi|156536572|gb|CY024931| /Human/2 (PB1)/H1N1/USA/1988/// Influenza A virus (A/Ohio/3559/1988(H1N1)) segment 2, complete sequence
gi|156536608|gb|CY025016| /Swine/2 (PB1)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3024/1987(H1N1)) segment 2, complete sequence
gi|158525309|gb|CY027161| /Swine/2 (PB1)/H1N1/USA/1991/// Influenza A virus (A/swine/Iowa/24297/1991(H1N1)) segment 2, complete sequence
gi|158958071|gb|CY027513| /Swine/2 (PB1)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/2/1985(H1N1)) segment 2, complete sequence
gi|166203502|gb|CY028786| /Swine/2 (PB1)/H1N1/USA/1991/// Influenza A virus (A/swine/California/T9001707/1991(H1N1)) segment 2, complete sequence
gi|208400892|gb|CY035076| /Swine/2 (PB1)/H1N1/USA/1990/// Influenza A virus (A/swine/Memphis/1/1990(H1N1)) segment 2, complete sequence
gi|229807666|gb|CY039923| /Swine/2 (PB1)/H1N1/USA/1988/// Influenza A Virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 2, complete sequence
gi|229809526|gb|CY039931| /Swine/2 (PB1)/H1N1/USA/1988/// Influenza A Virus (A/swine/Indiana/1726/1988(H1N1)) segment 2, complete sequence
gi|189313209|gb|EU735792| /Avian/2 (PB1)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/19762/1988(H1N1)) polymerase PB1 gene, complete cds.
gi|193877868|gb|EU743157| /Avian/2 (PB1)/H1N1/USA/1990/// Influenza A virus (A/turkey/IA/10271-3/1990(H1N1)) segment 2 polymerase PB1 (PB1) gene, complete cds.
gi|193877850|gb|EU743165| /Avian/2 (PB1)/H1N1/USA/1992/// Influenza A virus (A/turkey/IA/21089-3/1992(H1N1)) segment 2 polymerase PB1 (PB1) gene, complete cds.
gi|209164831|gb|FJ357110| /Avian/2 (PB1)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/17026/1988(H1N1)) segment 2 polymerase PB1 (PB1) gene, complete cds
gi|324963|gb|M25934| /Human/2 (PB1)/H1N1/USA/1988/// Influenza A virus (A/Wisconsin/3523/1988(H1N1)) PB1 polymerase subunit gene, complete cds.

Swine, EA, 29 sequences

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gi|216409281|gb|AB434318| /Swine/2 (PB1)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/NIAH589/2005(H1N1)) PB1 gene for polymerase PB1, complete cds
gi|216409299|gb|AB434326| /Swine/2 (PB1)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chachoengsao/NIAH587/2005(H1N1)) PB1 gene for polymerase PB1, complete cds
gi|13661047|gb|AJ311462| /Swine/2 (PB1)/H1N1/France/1982/// Influenza A virus PB1 gene for Polymerase 1 protein, genomic RNA, strain A/Swine/Finistere/2899/82

gi|78097319|gb|CY005499| /Avian/2 (PB1)/H7N1/China/1992/// Influenza A virus (A/duck/Nanchang/1904/1992(H7N1)) segment 2, complete sequence
gi|78097607|gb|CY005611| /Avian/2 (PB1)/H6N1/Hong Kong/1977/// Influenza A virus (A/chicken/Hong Kong/17/1977(H6N1)) segment 2, complete sequence
gi|89148266|gb|CY009378| /Swine/2 (PB1)/H3N2/Spain/2001/// Influenza A virus (A/swine/Spain/33601/2001(H3N2)) segment 2, complete sequence
gi|89148109|gb|CY009386| /Swine/2 (PB1)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/39139/2002(H3N2)) segment 2, complete sequence
gi|89789292|gb|CY009898| /Swine/2 (PB1)/H1N1/Spain/2003/// Influenza A virus (A/Swine/Spain/50047/2003(H1N1)) segment 2, complete sequence
gi|91177920|gb|CY010570| /Swine/2 (PB1)/H3N2/Spain/2004/// Influenza A virus (A/swine/Spain/54008/2004(H3N2)) segment 2, complete sequence
gi|91125708|gb|CY010578| /Swine/2 (PB1)/H1N1/Spain/2003/// Influenza A virus (A/swine/Spain/51915/2003(H1N1)) segment 2, complete sequence
gi|91177901|gb|CY010586| /Swine/2 (PB1)/H1N1/Spain/2004/// Influenza A virus (A/swine/Spain/53207/2004(H1N1)) segment 2, complete sequence
gi|133981555|gb|CY020507| /Swine/2 (PB1)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/42386/2002(H3N2)) segment 2, complete sequence
gi|85692716|gb|DQ351874| /Avian/2 (PB1)/H5N1/China/2001/// Influenza A virus (A/chicken/Hebei/718/2001(H5N1)) segment 2 polymerase basic protein 1 (PB1) gene, complete cds.
gi|110333748|gb|DQ836168| /Swine/2 (PB1)/H3N2/Germany/1996/// Influenza A virus (A/swine/Jena/5/96(H3N2)) polymerase subunit PB1 and PB1-F2 genes, complete cds
gi|110333754|gb|DQ836170| /Swine/2 (PB1)/H3N2/Germany/1999/// Influenza A virus (A/swine/Bakum/8602/99(H3N2)) polymerase subunit PB1 gene, complete cds
gi|110333756|gb|DQ836171| /Swine/2 (PB1)/H3N2/Germany/1982/// Influenza A virus (A/swine/Potsdam/35/82(H3N2)) polymerase subunit PB1 and PB1-F2 genes, complete cds
gi|110333759|gb|DQ836172| /Swine/2 (PB1)/H3N2/Germany/1997/// Influenza A virus (A/swine/Lohne/1/97(H3N2)) polymerase subunit PB1 and PB1-F2 genes, complete cds
gi|110333765|gb|DQ836174| /Swine/2 (PB1)/H1N1/Germany/1981/// Influenza A virus (A/swine/Potsdam/15/81(H1N1)) polymerase subunit PB1 and PB1-F2 genes, complete cds
gi|110333768|gb|DQ836175| /Swine/2 (PB1)/H1N1/Germany/1989/// Influenza A virus (A/swine/Schwerin/103/89(H1N1)) polymerase subunit PB1 and PB1-F2 genes, complete cds
gi|110333771|gb|DQ836176| /Swine/2 (PB1)/H1N1/Germany/1995/// Influenza A virus (A/swine/Bakum/5/95(H1N1)) polymerase subunit PB1 and PB1-F2 genes, complete cds
gi|110333774|gb|DQ836177| /Swine/2 (PB1)/H1N1/Germany/2001/// Influenza A virus (A/swine/Belzig/2/2001(H1N1)) polymerase subunit PB1 gene, complete cds
gi|110333776|gb|DQ836178| /Swine/2 (PB1)/H1N2/Germany/2000/// Influenza A virus (A/swine/Bakum/1832/00(H1N2)) polymerase subunit PB1 and PB1-F2 genes, complete cds
gi|110333779|gb|DQ836179| /Swine/2 (PB1)/H1N2/Germany/2000/// Influenza A virus (A/swine/Bakum/1833/00(H1N2)) polymerase subunit PB1 and PB1-F2 genes, complete cds
gi|153957904|gb|EU053131| /Swine/2 (PB1)/H1N2/Germany/2005/12/07/ Influenza A virus (A/swine/Doetlingen/IDT4735/2005(H1N2)) segment 2 polymerase subunit PB1 gene, complete cds.
gi|153958008|gb|EU053139| /Swine/2 (PB1)/H1N2/Germany/2005/12/13/ Influenza A virus (A/swine/Cloppenburg/IDT4777/2005(H1N2)) segment 2 polymerase subunit PB1 gene, complete cds.
gi|159156196|gb|EU182314| /Avian/2 (PB1)/H5N2/USA/1998/// Influenza A virus (A/chukar/MN/14591-7/1998(H5N2)) polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|192382753|gb|EU826549| /Swine/2 (PB1)/H3N2/Canada/2005/07/12/ Influenza A virus (A/swine/Quebec/4001/2005(H3N2)) segment 2 polymerase PB1 (PB1) gene, complete cds
gi|210076645|gb|FJ415614| /Swine/2 (PB1)/H1N1/China/2007/11/15/ Influenza A virus (A/swine/Zhejiang/1/2007(H1N1)) segment 2 polymerase PB1 (PB1) and putative PB1-F2 protein (PB1-F2) genes, complete cds
gi|211996966|gb|FJ432784| /Avian/2 (PB1)/H1N1/Italy/2003/// Influenza A virus (A/goose/Italy/296426/2003(H1N1)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds

Swine, NA and Human H3N2, 83 sequences

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gi|3722122|gb|AF037420| /Human/2 (PB1)/H3N2/Japan/1996/// Influenza A virus H3N2 A/Niigata/137/96 PB1 polymerase subunit (PB1) gene, complete cds.
gi|8515436|gb|AF250130| /Swine/2 (PB1)/H1N2/USA/1999/// Influenza A virus (A/Swine/Indiana/9K035/99 (H1N2)) polymerase subunit PB1 (PB1) gene, complete cds.
gi|9887133|gb|AF251405| /Swine/2 (PB1)/H3N2/USA/1998/// Influenza A virus (A/Swine/Nebraska/209/98 (H3N2)) PB1 polymerase subunit (PB1) gene, complete cds.
gi|9887150|gb|AF251413| /Swine/2 (PB1)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/533/99 (H3N2)) PB1 polymerase subunit (PB1) gene, complete cds.
gi|9887167|gb|AF251421| /Swine/2 (PB1)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/569/99 (H3N2)) PB1 polymerase subunit (PB1) gene, complete cds.
gi|9887184|gb|AF251429| /Swine/2 (PB1)/H3N2/USA/1999/// Influenza A virus (A/Swine/Minnesota/593/99 (H3N2)) PB1 polymerase subunit (PB1) gene, complete cds.
gi|29539583|gb|AF342823| /Human/2 (PB1)/H1N1/USA/1998/// Influenza A virus (A/Wisconsin/10/98 (H1N1)) PB1 gene, complete cds
gi|19422180|gb|AF455723| /Swine/2 (PB1)/H1N2/USA/2001/// Influenza A virus (A/Swine/Ohio/891/01(H1N2)) polymerase subunit (PB1) gene, complete cds.
gi|19422182|gb|AF455724| /Swine/2 (PB1)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/98225/01(H1N2)) polymerase subunit (PB1) gene, complete cds.
gi|19422184|gb|AF455725| /Swine/2 (PB1)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/93523/01 (H1N2)) polymerase subunit (PB1) gene, complete cds.
gi|19422186|gb|AF455726| /Swine/2 (PB1)/H1N2/USA/2000/// Influenza A virus (A/Swine/Minnesota/55551/00 (H1N2)) polymerase subunit (PB1) gene, complete cds
gi|19422188|gb|AF455727| /Swine/2 (PB1)/H1N2/USA/2001/// Influenza A virus (A/Swine/Iowa/930/01(H1N2)) polymerase subunit (PB1) gene, complete cds.
gi|19422190|gb|AF455728| /Swine/2 (PB1)/H1N2/USA/2000/// Influenza A virus (A/Swine/Indiana/P12439/00 (H1N2)) polymerase subunit (PB1) gene, complete cds.
gi|19422192|gb|AF455729| /Swine/2 (PB1)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100085A/01 (H1N2)) polymerase subunit (PB1) gene, complete cds.
gi|19422194|gb|AF455730| /Swine/2 (PB1)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100084/01 (H1N2)) polymerase subunit (PB1) gene, complete cds.
gi|24286096|gb|AY129162| /Swine/2 (PB1)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) polymerase subunit 1 (PB1) mRNA, complete cds
gi|30522956|gb|AY233388| /Avian/2 (PB1)/H1N2/USA/2001/// Influenza A virus (A/duck/NC/91347/01(H1N2)) polymerase subunit PB1 (PB1) gene, complete cds
gi|91127740|gb|CY010658| /Human/2 (PB1)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/611/1995(H3N2)) segment 2, complete sequence
gi|91127801|gb|CY010666| /Human/2 (PB1)/H3N2/USA/1995/12/19/ Influenza A virus (A/New York/612/1995(H3N2)) segment 2, complete sequence
gi|91128208|gb|CY010674| /Human/2 (PB1)/H3N2/USA/1996/01/10/ Influenza A virus (A/New York/613/1996(H3N2)) segment 2, complete sequence
gi|91128587|gb|CY010682| /Human/2 (PB1)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/618/1995(H3N2)) segment 2, complete sequence
gi|91129999|gb|CY010714| /Human/2 (PB1)/H3N2/USA/1995/12/12/ Influenza A virus (A/New York/628/1995(H3N2)) segment 2, complete sequence
gi|91130762|gb|CY010730| /Human/2 (PB1)/H3N2/USA/1995/12/08/ Influenza A virus (A/New York/634/1995(H3N2)) segment 2, complete sequence
gi|94959641|gb|CY010818| /Human/2 (PB1)/H3N2/USA/1995/12/29/ Influenza A virus (A/New York/623/1995(H3N2)) segment 2, complete sequence
gi|109675469|gb|CY011438| /Human/2 (PB1)/H3N2/USA/1996/02/16/ Influenza A virus (A/New York/624/1996(H3N2)) segment 2, complete sequence
gi|109675507|gb|CY011454| /Human/2 (PB1)/H3N2/USA/1996/01/18/ Influenza A virus (A/New

York/635/1996(H3N2)) segment 2, complete sequence
gi|109675545|gb|CY011470| /Human/2 (PB1)/H3N2/USA/1996/01/03/ Influenza A virus (A/New York/641/1996(H3N2)) segment 2, complete sequence
gi|109914700|gb|CY011894| /Human/2 (PB1)/H3N2/USA/1994/01/17/ Influenza A virus (A/New York/716/1994(H3N2)) segment 2, complete sequence
gi|110333432|gb|CY012222| /Human/2 (PB1)/H3N2/USA/1995/12/18/ Influenza A virus (A/New York/639/1995(H3N2)) segment 2, complete sequence
gi|110629742|gb|CY012750| /Human/2 (PB1)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/771/1993(H3N2)) segment 2, complete sequence
gi|110629780|gb|CY012766| /Human/2 (PB1)/H3N2/USA/1993/03/20/ Influenza A virus (A/New York/777/1993(H3N2)) segment 2, complete sequence
gi|110733720|gb|CY012974| /Human/2 (PB1)/H3N2/USA/1994/01/14/ Influenza A virus (A/New York/735/1994(H3N2)) segment 2, complete sequence
gi|112789121|gb|CY013683| /Human/2 (PB1)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/784/1993(H3N2)) segment 2, complete sequence
gi|112789178|gb|CY013707| /Human/2 (PB1)/H3N2/USA/1993/04/05/ Influenza A virus (A/New York/789/1993(H3N2)) segment 2, complete sequence
gi|112789330|gb|CY013771| /Human/2 (PB1)/H3N2/USA/1993/03/10/ Influenza A virus (A/New York/799/1993(H3N2)) segment 2, complete sequence
gi|115521554|gb|CY016489| /Human/2 (PB1)/H3N2/USA/1993/03/11/ Influenza A virus (A/New York/800/1993(H3N2)) segment 2, complete sequence
gi|76574387|gb|DQ145544| /Swine/2 (PB1)/H3N1/USA/2004/// Influenza A virus (A/swine/Minnesota/00395/2004(H3N1)) PB1 gene, complete cds
gi|75756545|gb|DQ150423| /Swine/2 (PB1)/H3N1/USA/2004/// Influenza A virus (A/swine/MI/PU243/04 (H3N1)) polymerase (PB1) gene, complete cds.
gi|75756561|gb|DQ150431| /Swine/2 (PB1)/H3N1/USA/2004/// Influenza A virus (A/swine/IN/PU542/04 (H3N1)) polymerase (PB1) gene, complete cds.
gi|84626347|gb|DQ335777| /Avian/2 (PB1)/H3N2/USA/2004/// Influenza A virus (A/turkey/Ohio/313053/04(H3N2)) polymerase PB1 (PB1) gene, complete cds
gi|94404679|gb|DQ469956| /Human/2 (PB1)/H3N2/Canada/2005/// Influenza A virus (A/Ontario/RV1273/2005(H3N2)) polymerase subunit PB1 (PB1) gene, complete cds
gi|94404681|gb|DQ469964| /Swine/2 (PB1)/H3N2/Canada/2005/// Influenza A virus (A/swine/Alberta/14722/2005(H3N2)) polymerase subunit PB1 (PB1) gene, complete cds
gi|94404683|gb|DQ469972| /Swine/2 (PB1)/H3N2/Canada/2005/// Influenza A virus (A/swine/British Columbia/28103/2005(H3N2)) polymerase subunit PB1 (PB1) gene, complete cds
gi|94404685|gb|DQ469980| /Swine/2 (PB1)/H3N2/Canada/2005/// Influenza A virus (A/swine/Manitoba/12707/2005(H3N2)) polymerase subunit PB1 (PB1) gene, complete cds
gi|94404687|gb|DQ469988| /Swine/2 (PB1)/H3N2/Canada/2005/// Influenza A virus (A/swine/Ontario/33853/2005(H3N2)) polymerase subunit PB1 (PB1) gene, complete cds
gi|94404689|gb|DQ469996| /Avian/2 (PB1)/H3N2/Canada/2005/// Influenza A virus (A/turkey/Ontario/31232/2005(H3N2)) polymerase subunit PB1 (PB1) gene, complete cds
gi|112456182|gb|DQ889683| /Human/2 (PB1)/H1N1/USA/2005/// Influenza A virus (A/Iowa/CEID23/2005(H1N1)) polymerase PB1 (PB1) gene, complete cds
gi|114215320|gb|DQ923518| /Swine/2 (PB1)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ72-1/2006(H3N1)) polymerase basic protein 1 (PB1) gene, complete cds
gi|114215322|gb|DQ923519| /Swine/2 (PB1)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/CN22/2006(H3N1)) polymerase basic protein 1 (PB1) gene, complete cds
gi|146454443|gb|EF551043| /Avian/2 (PB1)/H3N2/USA/2004/// Influenza A virus (A/turkey/Illinois/2004(H3N2)) segment 2 polymerase PB1 (PB1) gene, complete cds.
gi|146454461|gb|EF551051| /Swine/2 (PB1)/H3N2/USA/2003/// Influenza A virus (A/swine/North Carolina/2003(H3N2)) segment 2 polymerase PB1 (PB1) gene, complete cds.
gi|151175884|gb|EU015992| /Swine/2 (PB1)/H1N2/China/2006/// Influenza A virus (A/swine/Guangxi/13/2006(H1N2)) polymerase basic protein 1 (PB1) gene, complete cds.
gi|198387449|gb|EU301400| /Swine/2 (PB1)/H3N2/South Korea/2004/// Influenza A virus

(A/swine/Korea/JNS06/2004(H3N2)) polymerase PB1 (PB1) gene, complete cds
gi|188572616|gb|EU409945| /Swine/2 (PB1)/H1N1/USA/2007/// Influenza A virus (A/swine/Ohio/24366/07(H1N1)) polymerase PB1 (PB1) gene, complete cds
gi|188572618|gb|EU409954| /Swine/2 (PB1)/H1N1/USA/2004/// Influenza A virus (A/swine/Ohio/75004/04(H1N1)) polymerase PB1 (PB1) gene, complete cds
gi|188572620|gb|EU409959| /Swine/2 (PB1)/H1N1/USA/2006/// Influenza A virus (A/swine/Ohio/C62006/06(H1N1)) polymerase PB1 (PB1) gene, complete cds
gi|189313133|gb|EU735824| /Avian/2 (PB1)/H3N2/USA/2004/// Influenza A virus (A/turkey/OH/313053/2004(H3N2)) polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|189313114|gb|EU735832| /Avian/2 (PB1)/H3N2/USA/2005/// Influenza A virus (A/turkey/NC/353568/2005(H3N2)) polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|193877750|gb|EU743216| /Avian/2 (PB1)/H3N2/USA/2005/// Influenza A virus (A/turkey/MN/366767/2005(H3N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds.
gi|190403979|gb|EU798898| /Swine/2 (PB1)/H1N1/South Korea/2004/// Influenza A virus (A/swine/Korea/CAN01/2004(H1N1)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190403982|gb|EU798899| /Swine/2 (PB1)/H1N1/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS08/2005(H1N1)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190403985|gb|EU798900| /Swine/2 (PB1)/H1N2/South Korea/2004/// Influenza A virus (A/swine/Korea/Hongsong2/2004(H1N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190403988|gb|EU798901| /Swine/2 (PB1)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL01/2005(H1N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190403991|gb|EU798902| /Swine/2 (PB1)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL02/2005(H1N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190403994|gb|EU798903| /Swine/2 (PB1)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL04/2005(H1N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190403997|gb|EU798904| /Swine/2 (PB1)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/Asan04/2006(H1N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404000|gb|EU798905| /Swine/2 (PB1)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ4/2006(H1N2)) segment 2 polymerase PB1 (PB1) gene, complete cds
gi|190404002|gb|EU798906| /Swine/2 (PB1)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ7/2006(H1N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404005|gb|EU798907| /Swine/2 (PB1)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ14/2006(H1N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404008|gb|EU798908| /Swine/2 (PB1)/H1N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY08/2007(H1N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404011|gb|EU798909| /Swine/2 (PB1)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/CAS05/2004(H3N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404014|gb|EU798910| /Swine/2 (PB1)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAN04/2005(H3N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404017|gb|EU798911| /Swine/2 (PB1)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS07/2005(H3N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes,

complete cds
gi|190404020|gb|EU798912| /Swine/2 (PB1)/H3N2/South Korea/2006/// Influenza A virus (A/swine/Korea/CAS09/2006(H3N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404023|gb|EU798913| /Swine/2 (PB1)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY04/2007(H3N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404026|gb|EU798914| /Swine/2 (PB1)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY05/2007(H3N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404029|gb|EU798915| /Swine/2 (PB1)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY07/2007(H3N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404032|gb|EU798916| /Swine/2 (PB1)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY09/2007(H3N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|190404035|gb|EU798917| /Swine/2 (PB1)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY10/2007(H3N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|209486608|gb|FJ374513| /Swine/2 (PB1)/H1N2/China/2007/03/24/ Influenza A virus (A/swine/Shanghai/1/2007(H1N2)) segment 2 polymerase PB1 (PB1) and PB1-F2 protein (PB1-F2) genes, complete cds
gi|3721947|gb|U71130| /Human/2 (PB1)/H3N2/Japan/1995/// Influenza A virus H3N2 A/Shiga/20/95 PB1 polymerase subunit (PB1) gene, complete cds.
gi|3721949|gb|U71131| /Human/2 (PB1)/H3N2/Japan/1995/// Influenza A virus H3N2 A/Miyagi/29/95 PB1 polymerase subunit (PB1) gene, complete cds.
gi|227809825|gb|FJ966080| /Human/2 (PB1)/H1N1/USA/2009/04/01/ Influenza A virus (A/California/04/2009(H1N1)) segment 2 polymerase PB1 (PB1) gene, complete cds

Swine H1N1, NA, 19 sequences

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gi|149785316|gb|CY022322| /Swine/3 (PA)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/1/1985(H1N1)) segment 3, complete sequence
gi|149785267|gb|CY022330| /Swine/3 (PA)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/3/1985(H1N1)) segment 3, complete sequence
gi|149785194|gb|CY022338| /Swine/3 (PA)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/17672/1988(H1N1)) segment 3, complete sequence
gi|149785136|gb|CY022434| /Swine/3 (PA)/H1N1/USA/1988/// Influenza A virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 3, complete sequence
gi|149785063|gb|CY022474| /Swine/3 (PA)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3228/1987(H1N1)) segment 3, complete sequence
gi|149784983|gb|CY022482| /Swine/3 (PA)/H1N1/USA/1991/// Influenza A virus (A/swine/Maryland/23239/1991(H1N1)) segment 3, complete sequence
gi|152963540|gb|CY022975| /Swine/3 (PA)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/31483/1988(H1N1)) segment 3, complete sequence
gi|156536570|gb|CY024930| /Human/3 (PA)/H1N1/USA/1988/// Influenza A virus (A/Ohio/3559/1988(H1N1)) segment 3, complete sequence
gi|156536606|gb|CY025015| /Swine/3 (PA)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3024/1987(H1N1)) segment 3, complete sequence
gi|158525307|gb|CY027160| /Swine/3 (PA)/H1N1/USA/1991/// Influenza A virus (A/swine/Iowa/24297/1991(H1N1)) segment 3, complete sequence
gi|158958069|gb|CY027512| /Swine/3 (PA)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/2/1985(H1N1)) segment 3, complete sequence
gi|166203500|gb|CY028785| /Swine/3 (PA)/H1N1/USA/1991/// Influenza A virus (A/swine/California/T9001707/1991(H1N1)) segment 3, complete sequence
gi|208400890|gb|CY035075| /Swine/3 (PA)/H1N1/USA/1990/// Influenza A virus (A/swine/Memphis/1/1990(H1N1)) segment 3, complete sequence
gi|229807664|gb|CY039922| /Swine/3 (PA)/H1N1/USA/1988/// Influenza A Virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 3, complete sequence
gi|229809524|gb|CY039930| /Swine/3 (PA)/H1N1/USA/1988/// Influenza A Virus (A/swine/Indiana/1726/1988(H1N1)) segment 3, complete sequence
gi|189313207|gb|EU735791| /Avian/3 (PA)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/19762/1988(H1N1)) polymerase PA (PA) gene, complete cds.
gi|193877870|gb|EU743156| /Avian/3 (PA)/H1N1/USA/1990/// Influenza A virus (A/turkey/IA/10271-3/1990(H1N1)) segment 3 polymerase PA (PA) gene, complete cds.
gi|193877852|gb|EU743164| /Avian/3 (PA)/H1N1/USA/1992/// Influenza A virus (A/turkey/IA/21089-3/1992(H1N1)) segment 3 polymerase PA (PA) gene, complete cds.
gi|209164829|gb|FJ357109| /Avian/3 (PA)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/17026/1988(H1N1)) segment 3 polymerase PA (PA) gene, complete cds

Human H3N2, 22 sequences

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gi|3722134|gb|AF037426| /Human/3 (PA)/H3N2/Japan/1996/// Influenza A virus H3N2 A/Niigata/137/96 PA polymerase subunit (PA) gene, complete cds.
gi|91127738|gb|CY010657| /Human/3 (PA)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/611/1995(H3N2)) segment 3, complete sequence
gi|91127792|gb|CY010665| /Human/3 (PA)/H3N2/USA/1995/12/19/ Influenza A virus (A/New York/612/1995(H3N2)) segment 3, complete sequence
gi|91128202|gb|CY010673| /Human/3 (PA)/H3N2/USA/1996/01/10/ Influenza A virus (A/New York/613/1996(H3N2)) segment 3, complete sequence

gi|91128578|gb|CY010681| /Human/3 (PA)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/618/1995(H3N2)) segment 3, complete sequence
gi|91129987|gb|CY010713| /Human/3 (PA)/H3N2/USA/1995/12/12/ Influenza A virus (A/New York/628/1995(H3N2)) segment 3, complete sequence
gi|91130750|gb|CY010729| /Human/3 (PA)/H3N2/USA/1995/12/08/ Influenza A virus (A/New York/634/1995(H3N2)) segment 3, complete sequence
gi|94959639|gb|CY010817| /Human/3 (PA)/H3N2/USA/1995/12/29/ Influenza A virus (A/New York/623/1995(H3N2)) segment 3, complete sequence
gi|109675467|gb|CY011437| /Human/3 (PA)/H3N2/USA/1996/02/16/ Influenza A virus (A/New York/624/1996(H3N2)) segment 3, complete sequence
gi|109675505|gb|CY011453| /Human/3 (PA)/H3N2/USA/1996/01/18/ Influenza A virus (A/New York/635/1996(H3N2)) segment 3, complete sequence
gi|109675543|gb|CY011469| /Human/3 (PA)/H3N2/USA/1996/01/03/ Influenza A virus (A/New York/641/1996(H3N2)) segment 3, complete sequence
gi|109914698|gb|CY011893| /Human/3 (PA)/H3N2/USA/1994/01/17/ Influenza A virus (A/New York/716/1994(H3N2)) segment 3, complete sequence
gi|110333430|gb|CY012221| /Human/3 (PA)/H3N2/USA/1995/12/18/ Influenza A virus (A/New York/639/1995(H3N2)) segment 3, complete sequence
gi|110629740|gb|CY012749| /Human/3 (PA)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/771/1993(H3N2)) segment 3, complete sequence
gi|110629778|gb|CY012765| /Human/3 (PA)/H3N2/USA/1993/03/20/ Influenza A virus (A/New York/777/1993(H3N2)) segment 3, complete sequence
gi|110733718|gb|CY012973| /Human/3 (PA)/H3N2/USA/1994/01/14/ Influenza A virus (A/New York/735/1994(H3N2)) segment 3, complete sequence
gi|112789119|gb|CY013682| /Human/3 (PA)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/784/1993(H3N2)) segment 3, complete sequence
gi|112789176|gb|CY013706| /Human/3 (PA)/H3N2/USA/1993/04/05/ Influenza A virus (A/New York/789/1993(H3N2)) segment 3, complete sequence
gi|112789328|gb|CY013770| /Human/3 (PA)/H3N2/USA/1993/03/10/ Influenza A virus (A/New York/799/1993(H3N2)) segment 3, complete sequence
gi|115521552|gb|CY016488| /Human/3 (PA)/H3N2/USA/1993/03/11/ Influenza A virus (A/New York/800/1993(H3N2)) segment 3, complete sequence
gi|3721963|gb|U71138| /Human/3 (PA)/H3N2/Japan/1995/// Influenza A virus H3N2 A/Shiga/20/95 PA polymerase subunit (PA) gene, complete cds.
gi|3721965|gb|U71139| /Human/3 (PA)/H3N2/Japan/1995/// Influenza A virus H3N2 A/Miyagi/29/95 PA polymerase subunit (PA) gene, complete cds.

Swine, EA, 19 sequences
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gi|216409283|gb|AB434319| /Swine/3 (PA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/NIAH589/2005(H1N1)) PA gene for polymerase PA, complete cds
gi|216409301|gb|AB434327| /Swine/3 (PA)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chachoengsao/NIAH587/2005(H1N1)) PA gene for polymerase PA, complete cds
gi|14275694|gb|AJ293922| /Human/3 (PA)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) pa gene for polymerase A, genomic RNA
gi|20068068|gb|AJ311206| /Swine/3 (PA)/H1N2/Italy/1998/// Influenza A virus (A/swine/Italy/1521/98(H1N2)) partial PA gene for polymerase subunit, genomic RNA
gi|20068070|gb|AJ311207| /Swine/3 (PA)/H1N2/France/1997/// Influenza A virus (A/swine/Cotes d'Armor/790/97(H1N2)) partial PA gene for polymerase subunit, genomic RNA
gi|13661049|gb|AJ311463| /Swine/3 (PA)/H1N1/France/1982/// Influenza A virus PA gene for Polymerase A protein, genomic RNA, strain A/Swine/Finistere/2899/82
gi|20068083|gb|AJ312836| /Swine/3 (PA)/H1N1/France/1999/// Influenza A virus (A/swine/Ile et Vilaine/1455/99(H1N1)) PA gene for polymerase subunit, genomic RNA

gi|20068087|gb|AJ312838| /Swine/3 (PA)/H1N2/France/1999/// Influenza A virus (A/swine/Cotes d'Armor/604/99(H1N2)) PA gene for polymerase subunit, genomic RNA
gi|89148264|gb|CY009377| /Swine/3 (PA)/H3N2/Spain/2001/// Influenza A virus (A/swine/Spain/33601/2001(H3N2)) segment 3, complete sequence
gi|89148107|gb|CY009385| /Swine/3 (PA)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/39139/2002(H3N2)) segment 3, complete sequence
gi|89789290|gb|CY009897| /Swine/3 (PA)/H1N1/Spain/2003/// Influenza A virus (A/Swine/Spain/50047/2003(H1N1)) segment 3, complete sequence
gi|91177918|gb|CY010569| /Swine/3 (PA)/H3N2/Spain/2004/// Influenza A virus (A/swine/Spain/54008/2004(H3N2)) segment 3, complete sequence
gi|91125706|gb|CY010577| /Swine/3 (PA)/H1N1/Spain/2003/// Influenza A virus (A/swine/Spain/51915/2003(H1N1)) segment 3, complete sequence
gi|91177899|gb|CY010585| /Swine/3 (PA)/H1N1/Spain/2004/// Influenza A virus (A/swine/Spain/53207/2004(H1N1)) segment 3, complete sequence
gi|133981544|gb|CY020506| /Swine/3 (PA)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/42386/2002(H3N2)) segment 3, complete sequence
gi|153957916|gb|EU053132| /Swine/3 (PA)/H1N2/Germany/2005/12/07/ Influenza A virus (A/swine/Doetlingen/IDT4735/2005(H1N2)) segment 3 polymerase subunit PA gene, complete cds.
gi|153958022|gb|EU053140| /Swine/3 (PA)/H1N2/Germany/2005/12/13/ Influenza A virus (A/swine/Cloppenburg/IDT4777/2005(H1N2)) segment 3 polymerase subunit PA gene, complete cds.
gi|192382751|gb|EU826548| /Swine/3 (PA)/H3N2/Canada/2005/07/12/ Influenza A virus (A/swine/Quebec/4001/2005(H3N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|210076650|gb|FJ415616| /Swine/3 (PA)/H1N1/China/2007/11/15/ Influenza A virus (A/swine/Zhejiang/1/2007(H1N1)) segment 3 polymerase PA (PA) gene, complete cds

Swine, NA, 63 sequences
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gi|8515434|gb|AF250129| /Swine/3 (PA)/H1N2/USA/1999/// Influenza A virus (A/Swine/Indiana/9K035/99 (H1N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|9887142|gb|AF251409| /Swine/3 (PA)/H3N2/USA/1998/// Influenza A virus (A/Swine/Nebraska/209/98 (H3N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|9887159|gb|AF251417| /Swine/3 (PA)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/533/99 (H3N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|9887176|gb|AF251425| /Swine/3 (PA)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/569/99 (H3N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|9887193|gb|AF251433| /Swine/3 (PA)/H3N2/USA/1999/// Influenza A virus (A/Swine/Minnesota/593/99 (H3N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|19422164|gb|AF455715| /Swine/3 (PA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Ohio/891/01(H1N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|19422166|gb|AF455716| /Swine/3 (PA)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/98225/01(H1N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|19422168|gb|AF455717| /Swine/3 (PA)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/93523/01 (H1N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|19422170|gb|AF455718| /Swine/3 (PA)/H1N2/USA/2000/// Influenza A virus (A/Swine/Minnesota/55551/00 (H1N2)) polymerase acidic protein 2 (PA) gene, complete cds
gi|19422172|gb|AF455719| /Swine/3 (PA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Iowa/930/01(H1N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|19422174|gb|AF455720| /Swine/3 (PA)/H1N2/USA/2000/// Influenza A virus (A/Swine/Indiana/P12439/00 (H1N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|19422176|gb|AF455721| /Swine/3 (PA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100085A/01 (H1N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|19422178|gb|AF455722| /Swine/3 (PA)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100084/01 (H1N2)) polymerase acidic protein 2 (PA) gene, complete cds.

gi|24286087|gb|AY129161| /Swine/3 (PA)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) polymerase acidic protein 2 (PA) mRNA, complete cds
gi|30522958|gb|AY233389| /Avian/3 (PA)/H1N2/USA/2001/// Influenza A virus (A/duck/NC/91347/01(H1N2)) acidic protein 2 (PA) gene, complete cds
gi|78097317|gb|CY005498| /Avian/3 (PA)/H7N1/China/1992/// Influenza A virus (A/duck/Nanchang/1904/1992(H7N1)) segment 3, complete sequence
gi|78097605|gb|CY005610| /Avian/3 (PA)/H6N1/Hong Kong/1977/// Influenza A virus (A/chicken/Hong Kong/17/1977(H6N1)) segment 3, complete sequence
gi|194323036|gb|CY033792| /Avian/3 (PA)/H3N2/USA/2007/09/19/ Influenza A virus (A/pintail duck/South Dakota/Sg-00126/2007(H3N2)) segment 3 sequence
gi|76574377|gb|DQ145539| /Swine/3 (PA)/H3N1/USA/2004/// Influenza A virus (A/swine/Minnesota/00395/2004(H3N1)) PA gene, complete cds
gi|75756547|gb|DQ150424| /Swine/3 (PA)/H3N1/USA/2004/// Influenza A virus (A/swine/MI/PU243/04 (H3N1)) polymerase (PA) gene, complete cds.
gi|75756563|gb|DQ150432| /Swine/3 (PA)/H3N1/USA/2004/// Influenza A virus (A/swine/IN/PU542/04 (H3N1)) polymerase (PA) gene, complete cds.
gi|84626345|gb|DQ335776| /Avian/3 (PA)/H3N2/USA/2004/// Influenza A virus (A/turkey/Ohio/313053/04(H3N2)) polymerase (PA) gene, complete cds
gi|85692706|gb|DQ351869| /Avian/3 (PA)/H5N1/China/2001/// Influenza A virus (A/chicken/Hebei/718/2001(H5N1)) segment 3 polymerase protein A (PA) gene, complete cds.
gi|94404655|gb|DQ469957| /Human/3 (PA)/H3N2/Canada/2005/// Influenza A virus (A/Ontario/RV1273/2005(H3N2)) polymerase acidic protein 2 (PA) gene, complete cds
gi|94404657|gb|DQ469965| /Swine/3 (PA)/H3N2/Canada/2005/// Influenza A virus (A/swine/Alberta/14722/2005(H3N2)) polymerase acidic protein 2 (PA) gene, complete cds
gi|94404659|gb|DQ469973| /Swine/3 (PA)/H3N2/Canada/2005/// Influenza A virus (A/swine/British Columbia/28103/2005(H3N2)) polymerase acidic protein 2 (PA) gene, complete cds
gi|94404661|gb|DQ469981| /Swine/3 (PA)/H3N2/Canada/2005/// Influenza A virus (A/swine/Manitoba/12707/2005(H3N2)) polymerase acidic protein 2 (PA) gene, complete cds
gi|94404663|gb|DQ469989| /Swine/3 (PA)/H3N2/Canada/2005/// Influenza A virus (A/swine/Ontario/33853/2005(H3N2)) polymerase acidic protein 2 (PA) gene, complete cds
gi|94404665|gb|DQ469997| /Avian/3 (PA)/H3N2/Canada/2005/// Influenza A virus (A/turkey/Ontario/31232/2005(H3N2)) polymerase acidic protein 2 (PA) gene, complete cds
gi|112456198|gb|DQ889684| /Human/3 (PA)/H1N1/USA/2005/// Influenza A virus (A/Iowa/CEID23/2005(H1N1)) polymerase PA (PA) gene, complete cds
gi|114215316|gb|DQ923516| /Swine/3 (PA)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ72-1/2006(H3N1)) polymerase acidic protein (PA) gene, complete cds
gi|114215318|gb|DQ923517| /Swine/3 (PA)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/CN22/2006(H3N1)) polymerase acidic protein (PA) gene, complete cds
gi|146454445|gb|EF551044| /Avian/3 (PA)/H3N2/USA/2004/// Influenza A virus (A/turkey/Illinois/2004(H3N2)) segment 3 polymerase PA (PA) gene, complete cds.
gi|146454463|gb|EF551052| /Swine/3 (PA)/H3N2/USA/2003/// Influenza A virus (A/swine/North Carolina/2003(H3N2)) segment 3 polymerase PA (PA) gene, complete cds.
gi|151175882|gb|EU015991| /Swine/3 (PA)/H1N2/China/2006/// Influenza A virus (A/swine/Guangxi/13/2006(H1N2)) polymerase acidic protein 2 (PA) gene, complete cds.
gi|156255055|gb|EU084947| /Avian/3 (PA)/H5N2/USA/1998/// Influenza A virus (A/chukar/MN/14591-7/1998(H5N2)) segment 3, complete sequence
gi|198387447|gb|EU301368| /Swine/3 (PA)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) polymerase PA (PA) gene, complete cds.
gi|189313131|gb|EU735823| /Avian/3 (PA)/H3N2/USA/2004/// Influenza A virus (A/turkey/OH/313053/2004(H3N2)) polymerase PA (PA) gene, complete cds
gi|189313112|gb|EU735831| /Avian/3 (PA)/H3N2/USA/2005/// Influenza A virus (A/turkey/NC/353568/2005(H3N2)) polymerase PA (PA) gene, complete cds
gi|193877753|gb|EU743215| /Avian/3 (PA)/H3N2/USA/2005/// Influenza A virus (A/turkey/MN/366767/2005(H3N2)) segment 3 polymerase PA (PA) gene, complete cds.

gi|190403939|gb|EU798878| /Swine/3 (PA)/H1N1/South Korea/2004/// Influenza A virus (A/swine/Korea/CAN01/2004(H1N1)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403941|gb|EU798879| /Swine/3 (PA)/H1N1/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS08/2005(H1N1)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403943|gb|EU798880| /Swine/3 (PA)/H1N2/South Korea/2004/// Influenza A virus (A/swine/Korea/Hongsong2/2004(H1N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403945|gb|EU798881| /Swine/3 (PA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL01/2005(H1N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403947|gb|EU798882| /Swine/3 (PA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL02/2005(H1N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403949|gb|EU798883| /Swine/3 (PA)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL04/2005(H1N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403951|gb|EU798884| /Swine/3 (PA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/Asan04/2006(H1N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403953|gb|EU798885| /Swine/3 (PA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ4/2006(H1N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403955|gb|EU798886| /Swine/3 (PA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ7/2006(H1N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403957|gb|EU798887| /Swine/3 (PA)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ14/2006(H1N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403959|gb|EU798888| /Swine/3 (PA)/H1N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY08/2007(H1N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403961|gb|EU798889| /Swine/3 (PA)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/CAS05/2004(H3N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403963|gb|EU798890| /Swine/3 (PA)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAN04/2005(H3N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403965|gb|EU798891| /Swine/3 (PA)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS07/2005(H3N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403967|gb|EU798892| /Swine/3 (PA)/H3N2/South Korea/2006/// Influenza A virus (A/swine/Korea/CAS09/2006(H3N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403969|gb|EU798893| /Swine/3 (PA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY04/2007(H3N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403971|gb|EU798894| /Swine/3 (PA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY05/2007(H3N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403973|gb|EU798895| /Swine/3 (PA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY07/2007(H3N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403975|gb|EU798896| /Swine/3 (PA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY09/2007(H3N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|190403977|gb|EU798897| /Swine/3 (PA)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY10/2007(H3N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|209486618|gb|FJ374517| /Swine/3 (PA)/H1N2/China/2007/03/24/ Influenza A virus (A/swine/Shanghai/1/2007(H1N2)) segment 3 polymerase PA (PA) gene, complete cds
gi|211996964|gb|FJ432783| /Avian/3 (PA)/H1N1/Italy/2003/// Influenza A virus (A/goose/Italy/296426/2003(H1N1)) segment 3 polymerase PA (PA) gene, complete cds
gi|227809827|gb|FJ966081| /Human/3 (PA)/H1N1/USA/2009/04/01/ Influenza A virus (A/California/04/2009(H1N1)) segment 3 polymerase PA (PA) gene, complete cds

Swine, EA, 28 sequences

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gi|216409287|gb|AB434321| /Swine/5 (NP)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/NIAH589/2005(H1N1)) NP gene for nucleoprotein, complete cds
gi|216409305|gb|AB434329| /Swine/5 (NP)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chachoengsao/NIAH587/2005(H1N1)) NP gene for nucleoprotein, complete cds
gi|14275698|gb|AJ293924| /Human/5 (NP)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) np gene for nucleoprotein, genomic RNA
gi|20068042|gb|AJ307065| /Swine/5 (NP)/H1N2/France/1997/// Influenza A virus (A/swine/Cotes d'Armor/790/97(H1N2)) NP gene for nucleoprotein, genomic RNA
gi|20068046|gb|AJ307067| /Swine/5 (NP)/H1N2/Italy/1998/// Influenza A virus (A/swine/Italy/1521/98(H1N2)) NP gene for nucleoprotein, genomic RNA
gi|20068060|gb|AJ307074| /Swine/5 (NP)/H1N2/France/1999/// Influenza A virus (A/swine/Cotes d'Armor/604/99(H1N2)) NP gene for nucleoprotein, genomic RNA
gi|164511474|gb|AM746619| /Swine/5 (NP)/H3N2/Germany/2006/// Influenza A virus (A/wild boar/Germany/WS169/2006(H3N2)) NP gene for nucleoprotein, genomic RNA
gi|78097312|gb|CY005496| /Avian/5 (NP)/H7N1/China/1992/// Influenza A virus (A/duck/Nanchang/1904/1992(H7N1)) segment 5, complete sequence
gi|78097600|gb|CY005608| /Avian/5 (NP)/H6N1/Hong Kong/1977/// Influenza A virus (A/chicken/Hong Kong/17/1977(H6N1)) segment 5, complete sequence
gi|89148259|gb|CY009375| /Swine/5 (NP)/H3N2/Spain/2001/// Influenza A virus (A/swine/Spain/33601/2001(H3N2)) segment 5, complete sequence
gi|89148102|gb|CY009383| /Swine/5 (NP)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/39139/2002(H3N2)) segment 5, complete sequence
gi|89789285|gb|CY009895| /Swine/5 (NP)/H1N1/Spain/2003/// Influenza A virus (A/Swine/Spain/50047/2003(H1N1)) segment 5, complete sequence
gi|91177913|gb|CY010567| /Swine/5 (NP)/H3N2/Spain/2004/// Influenza A virus (A/swine/Spain/54008/2004(H3N2)) segment 5, complete sequence
gi|91125701|gb|CY010575| /Swine/5 (NP)/H1N1/Spain/2003/// Influenza A virus (A/swine/Spain/51915/2003(H1N1)) segment 5, complete sequence
gi|91177894|gb|CY010583| /Swine/5 (NP)/H1N1/Spain/2004/// Influenza A virus (A/swine/Spain/53207/2004(H1N1)) segment 5, complete sequence
gi|133981520|gb|CY020504| /Swine/5 (NP)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/42386/2002(H3N2)) segment 5, complete sequence
gi|85692696|gb|DQ351864| /Avian/5 (NP)/H5N1/China/2001/// Influenza A virus (A/chicken/Hebei/718/2001(H5N1)) segment 5 nucleoprotein (NP) gene, complete cds.
gi|117935812|gb|EF101752| /Human/5 (NP)/H1N1/Thailand/2005/07/14/ Influenza A virus (A/Thailand/271/2005(H1N1)) nucleocapsid protein gene, partial cds
gi|153957941|gb|EU053134| /Swine/5 (NP)/H1N2/Germany/2005/12/07/ Influenza A virus (A/swine/Doetlingen/IDT4735/2005(H1N2)) segment 5 nucleoprotein gene, complete cds.
gi|153958046|gb|EU053142| /Swine/5 (NP)/H1N2/Germany/2005/12/13/ Influenza A virus (A/swine/Cloppenburg/IDT4777/2005(H1N2)) segment 5 nucleoprotein gene, complete cds.
gi|156255083|gb|EU084948| /Avian/5 (NP)/H5N2/USA/1998/// Influenza A virus (A/chukar/MN/14591-7/1998(H5N2)) segment 5, complete sequence
gi|192382743|gb|EU826545| /Swine/5 (NP)/H3N2/Canada/2005/07/12/ Influenza A virus (A/swine/Quebec/4001/2005(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|210076652|gb|FJ415617| /Swine/5 (NP)/H1N1/China/2007/11/15/ Influenza A virus (A/swine/Zhejiang/1/2007(H1N1)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|211996959|gb|FJ432781| /Avian/5 (NP)/H1N1/Italy/2003/// Influenza A virus (A/goose/Italy/296426/2003(H1N1)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|325011|gb|M22344| /Avian/5 (NP)/H7N1/Ireland/1973/// Influenza A virus (A/parrot/Ulster/1973(H7N1)) segment 5 nucleoprotein gene, complete cds

gi|325056|gb|M22579| /Swine/5 (NP)/H1N1/Germany/1981/// Influenza A virus (A/swine/Germany/2/1981(H1N1)) segment 5 nucleoprotein gene, complete cds.
gi|438087|gb|Z26856| /Swine/5 (NP)/H1N1/Germany/1991/// Influenza A virus(A/swine/Germany/8533/91(H1N1)) NP gene for nucleoprotein
gi|438089|gb|Z26857| /Avian/5 (NP)/H1N1/Germany/1991/// Influenza A virus(A/turkey/Germany/3/91(H1N1)) NP gene for nucleoprotein

Human H3N2, 22 sequences
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gi|3722162|gb|AF038256| /Human/5 (NP)/H3N2/Japan/1996/// Influenza A virus H3N2 A/Niigata/137/96 nucleoprotein (NP) gene, complete cds.
gi|91127733|gb|CY010655| /Human/5 (NP)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/611/1995(H3N2)) segment 5, complete sequence
gi|91127774|gb|CY010663| /Human/5 (NP)/H3N2/USA/1995/12/19/ Influenza A virus (A/New York/612/1995(H3N2)) segment 5, complete sequence
gi|106896315|gb|CY010671| /Human/5 (NP)/H3N2/USA/1996/01/10/ Influenza A virus (A/New York/613/1996(H3N2)) segment 5, complete sequence
gi|109675454|gb|CY010679| /Human/5 (NP)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/618/1995(H3N2)) segment 5, complete sequence
gi|91129967|gb|CY010711| /Human/5 (NP)/H3N2/USA/1995/12/12/ Influenza A virus (A/New York/628/1995(H3N2)) segment 5, complete sequence
gi|91130733|gb|CY010727| /Human/5 (NP)/H3N2/USA/1995/12/08/ Influenza A virus (A/New York/634/1995(H3N2)) segment 5, complete sequence
gi|94959634|gb|CY010815| /Human/5 (NP)/H3N2/USA/1995/12/29/ Influenza A virus (A/New York/623/1995(H3N2)) segment 5, complete sequence
gi|109675462|gb|CY011435| /Human/5 (NP)/H3N2/USA/1996/02/16/ Influenza A virus (A/New York/624/1996(H3N2)) segment 5, complete sequence
gi|109675500|gb|CY011451| /Human/5 (NP)/H3N2/USA/1996/01/18/ Influenza A virus (A/New York/635/1996(H3N2)) segment 5, complete sequence
gi|109675538|gb|CY011467| /Human/5 (NP)/H3N2/USA/1996/01/03/ Influenza A virus (A/New York/641/1996(H3N2)) segment 5, complete sequence
gi|109914693|gb|CY011891| /Human/5 (NP)/H3N2/USA/1994/01/17/ Influenza A virus (A/New York/716/1994(H3N2)) segment 5, complete sequence
gi|110333425|gb|CY012219| /Human/5 (NP)/H3N2/USA/1995/12/18/ Influenza A virus (A/New York/639/1995(H3N2)) segment 5, complete sequence
gi|110629735|gb|CY012747| /Human/5 (NP)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/771/1993(H3N2)) segment 5, complete sequence
gi|110629773|gb|CY012763| /Human/5 (NP)/H3N2/USA/1993/03/20/ Influenza A virus (A/New York/777/1993(H3N2)) segment 5, complete sequence
gi|110733713|gb|CY012971| /Human/5 (NP)/H3N2/USA/1994/01/14/ Influenza A virus (A/New York/735/1994(H3N2)) segment 5, complete sequence
gi|112789114|gb|CY013680| /Human/5 (NP)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/784/1993(H3N2)) segment 5, complete sequence
gi|112789171|gb|CY013704| /Human/5 (NP)/H3N2/USA/1993/04/05/ Influenza A virus (A/New York/789/1993(H3N2)) segment 5, complete sequence
gi|112789323|gb|CY013768| /Human/5 (NP)/H3N2/USA/1993/03/10/ Influenza A virus (A/New York/799/1993(H3N2)) segment 5, complete sequence
gi|115521547|gb|CY016486| /Human/5 (NP)/H3N2/USA/1993/03/11/ Influenza A virus (A/New York/800/1993(H3N2)) segment 5, complete sequence
gi|3721979|gb|U71146| /Human/5 (NP)/H3N2/Japan/1995/// Influenza A virus H3N2 A/Shiga/20/95 nucleoprotein (NP) gene, complete cds.
gi|3721981|gb|U71147| /Human/5 (NP)/H3N2/Japan/1995/// Influenza A virus H3N2 A/Miyagi/29/95 nucleoprotein (NP) gene, complete cds.

Swine, NA, 84 sequences

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gi|8515429|gb|AF250127| /Swine/5 (NP)/H1N2/USA/1999/// Influenza A virus (A/Swine/Indiana/9K035/99 (H1N2)) nucleoprotein (NP) gene, complete cds.
gi|10335487|gb|AF251407| /Swine/5 (NP)/H3N2/USA/1998/// Influenza A virus (A/Swine/Nebraska/209/98 (H3N2)) nucleoprotein (NP) gene, complete cds.
gi|10335490|gb|AF251415| /Swine/5 (NP)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/533/99 (H3N2)) nucleoprotein (NP) gene, complete cds.
gi|10335493|gb|AF251423| /Swine/5 (NP)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/569/99 (H3N2)) nucleoprotein (NP) gene, complete cds.
gi|10335496|gb|AF251431| /Swine/5 (NP)/H3N2/USA/1999/// Influenza A virus (A/Swine/Minnesota/593/99 (H3N2)) nucleoprotein (NP) gene, complete cds.
gi|29539575|gb|AF342819| /Human/5 (NP)/H1N1/USA/1998/// Influenza A virus (A/Wisconsin/10/98 (H1N1)) nucleoprotein gene, complete cds
gi|19422124|gb|AF455699| /Swine/5 (NP)/H1N2/USA/2001/// Influenza A virus (A/Swine/Ohio/891/01(H1N2)) nucleoprotein (NP) gene, complete cds.
gi|19422126|gb|AF455700| /Swine/5 (NP)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/98225/01(H1N2)) nucleoprotein (NP) gene, complete cds.
gi|19422128|gb|AF455701| /Swine/5 (NP)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/93523/01 (H1N2)) nucleoprotein (NP) gene, complete cds.
gi|19422130|gb|AF455702| /Swine/5 (NP)/H1N2/USA/2000/// Influenza A virus (A/Swine/Minnesota/55551/00 (H1N2)) nucleoprotein (NP) gene, complete cds
gi|19422132|gb|AF455703| /Swine/5 (NP)/H1N2/USA/2001/// Influenza A virus (A/Swine/Iowa/930/01(H1N2)) nucleoprotein (NP) gene, complete cds.
gi|19422134|gb|AF455704| /Swine/5 (NP)/H1N2/USA/2000/// Influenza A virus (A/Swine/Indiana/P12439/00 (H1N2)) nucleoprotein (NP) gene, complete cds.
gi|19422136|gb|AF455705| /Swine/5 (NP)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100085A/01 (H1N2)) nucleoprotein (NP) gene, complete cds.
gi|19422138|gb|AF455706| /Swine/5 (NP)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100084/01 (H1N2)) nucleoprotein (NP) gene, complete cds.
gi|24286069|gb|AY129159| /Swine/5 (NP)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) nucleoprotein (NP) mRNA, complete cds
gi|30522969|gb|AY233394| /Avian/5 (NP)/H1N2/USA/2001/// Influenza A virus (A/duck/NC/91347/01(H1N2)) nucleoprotein (NP) gene, complete cds
gi|149785310|gb|CY022320| /Swine/5 (NP)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/1/1985(H1N1)) segment 5, complete sequence
gi|149785261|gb|CY022328| /Swine/5 (NP)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/3/1985(H1N1)) segment 5, complete sequence
gi|149785189|gb|CY022336| /Swine/5 (NP)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/17672/1988(H1N1)) segment 5, complete sequence
gi|149785131|gb|CY022432| /Swine/5 (NP)/H1N1/USA/1988/// Influenza A virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 5, complete sequence
gi|149785058|gb|CY022472| /Swine/5 (NP)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3228/1987(H1N1)) segment 5, complete sequence
gi|149784977|gb|CY022480| /Swine/5 (NP)/H1N1/USA/1991/// Influenza A virus (A/swine/Maryland/23239/1991(H1N1)) segment 5, complete sequence
gi|152963535|gb|CY022973| /Swine/5 (NP)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/31483/1988(H1N1)) segment 5, complete sequence
gi|156536565|gb|CY024928| /Human/5 (NP)/H1N1/USA/1988/// Influenza A virus (A/Ohio/3559/1988(H1N1)) segment 5, complete sequence
gi|156536601|gb|CY025013| /Swine/5 (NP)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3024/1987(H1N1)) segment 5, complete sequence

gi|158525302|gb|CY027158| /Swine/5 (NP)/H1N1/USA/1991/// Influenza A virus (A/swine/Iowa/24297/1991(H1N1)) segment 5, complete sequence
gi|158958064|gb|CY027510| /Swine/5 (NP)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/2/1985(H1N1)) segment 5, complete sequence
gi|166203495|gb|CY028783| /Swine/5 (NP)/H1N1/USA/1991/// Influenza A virus (A/swine/California/T9001707/1991(H1N1)) segment 5, complete sequence
gi|208400885|gb|CY035073| /Swine/5 (NP)/H1N1/USA/1990/// Influenza A virus (A/swine/Memphis/1/1990(H1N1)) segment 5, complete sequence
gi|229807659|gb|CY039920| /Swine/5 (NP)/H1N1/USA/1988/// Influenza A Virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 5, complete sequence
gi|229809519|gb|CY039928| /Swine/5 (NP)/H1N1/USA/1988/// Influenza A Virus (A/swine/Indiana/1726/1988(H1N1)) segment 5, complete sequence
gi|75756551|gb|DQ150426| /Swine/5 (NP)/H3N1/USA/2004/// Influenza A virus (A/swine/MI/PU243/04 (H3N1)) nucleoprotein (NP) gene, complete cds.
gi|75756567|gb|DQ150434| /Swine/5 (NP)/H3N1/USA/2004/// Influenza A virus (A/swine/IN/PU542/04 (H3N1)) nucleoprotein (NP) gene, complete cds.
gi|84626341|gb|DQ335774| /Avian/5 (NP)/H3N2/USA/2004/// Influenza A virus (A/turkey/Ohio/313053/04(H3N2)) nucleoprotein (NP) gene, complete cds
gi|94404625|gb|DQ469959| /Human/5 (NP)/H3N2/Canada/2005/// Influenza A virus (A/Ontario/RV1273/2005(H3N2)) nucleoprotein (NP) gene, complete cds
gi|94404627|gb|DQ469967| /Swine/5 (NP)/H3N2/Canada/2005/// Influenza A virus (A/swine/Alberta/14722/2005(H3N2)) nucleoprotein (NP) gene, complete cds
gi|94404629|gb|DQ469975| /Swine/5 (NP)/H3N2/Canada/2005/// Influenza A virus (A/swine/British Columbia/28103/2005(H3N2)) nucleoprotein (NP) gene, complete cds
gi|94404631|gb|DQ469983| /Swine/5 (NP)/H3N2/Canada/2005/// Influenza A virus (A/swine/Manitoba/12707/2005(H3N2)) nucleoprotein (NP) gene, complete cds
gi|94404633|gb|DQ469991| /Swine/5 (NP)/H3N2/Canada/2005/// Influenza A virus (A/swine/Ontario/33853/2005(H3N2)) nucleoprotein (NP) gene, complete cds
gi|94404635|gb|DQ469999| /Avian/5 (NP)/H3N2/Canada/2005/// Influenza A virus (A/turkey/Ontario/31232/2005(H3N2)) nucleoprotein (NP) gene, complete cds
gi|109501341|gb|DQ666936| /Swine/5 (NP)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/S11/2005(H1N2)) segment 5 nucleoprotein gene, complete cds.
gi|112456236|gb|DQ889686| /Human/5 (NP)/H1N1/USA/2005/// Influenza A virus (A/Iowa/CEID23/2005(H1N1)) nucleoprotein (NP) gene, complete cds
gi|114215308|gb|DQ923512| /Swine/5 (NP)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ72-1/2006(H3N1)) nucleoprotein (NP) gene, complete cds
gi|114215310|gb|DQ923513| /Swine/5 (NP)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/CN22/2006(H3N1)) nucleoprotein (NP) gene, complete cds
gi|146454467|gb|EF551054| /Swine/5 (NP)/H3N2/USA/2003/// Influenza A virus (A/swine/North Carolina/2003(H3N2)) segment 5 nucleoprotein (NP) gene, complete cds.
gi|151175880|gb|EU015990| /Swine/5 (NP)/H1N2/China/2006/// Influenza A virus (A/swine/Guangxi/13/2006(H1N2)) nucleoprotein (NP) gene, complete cds.
gi|198387445|gb|EU301304| /Swine/5 (NP)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) nucleoprotein (NP) gene, complete cds.
gi|187763981|gb|EU697205| /Avian/5 (NP)/H3N2/USA/2005/// Influenza A virus (A/turkey/Minnesota/366767/2005(H3N2)) nucleocapsid protein (NP) gene, complete cds
gi|189313202|gb|EU735789| /Avian/5 (NP)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/19762/1988(H1N1)) nucleocapsid protein (NP) gene, complete cds.
gi|189313126|gb|EU735821| /Avian/5 (NP)/H3N2/USA/2004/// Influenza A virus (A/turkey/OH/313053/2004(H3N2)) nucleocapsid protein (NP) gene, complete cds
gi|189313107|gb|EU735829| /Avian/5 (NP)/H3N2/USA/2005/// Influenza A virus (A/turkey/NC/353568/2005(H3N2)) nucleocapsid protein (NP) gene, complete cds
gi|193877872|gb|EU743154| /Avian/5 (NP)/H1N1/USA/1990/// Influenza A virus (A/turkey/IA/10271-3/1990(H1N1)) segment 5 nucleocapsid protein (NP) gene, complete cds.

gi|193877854|gb|EU743162| /Avian/5 (NP)/H1N1/USA/1992/// Influenza A virus (A/turkey/IA/21089-3/1992(H1N1)) segment 5 nucleocapsid protein (NP) gene, complete cds.
gi|193877762|gb|EU743213| /Avian/5 (NP)/H3N2/USA/2005/// Influenza A virus (A/turkey/MN/366767/2005(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds.
gi|190403839|gb|EU798838| /Swine/5 (NP)/H1N1/South Korea/2004/// Influenza A virus (A/swine/Korea/CAN01/2004(H1N1)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403841|gb|EU798839| /Swine/5 (NP)/H1N1/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS08/2005(H1N1)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403843|gb|EU798840| /Swine/5 (NP)/H1N2/South Korea/2004/// Influenza A virus (A/swine/Korea/Hongsong2/2004(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403845|gb|EU798841| /Swine/5 (NP)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL01/2005(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403847|gb|EU798842| /Swine/5 (NP)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL02/2005(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403849|gb|EU798843| /Swine/5 (NP)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL04/2005(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403851|gb|EU798844| /Swine/5 (NP)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/Asan04/2006(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403853|gb|EU798845| /Swine/5 (NP)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ4/2006(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403855|gb|EU798846| /Swine/5 (NP)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ7/2006(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403857|gb|EU798847| /Swine/5 (NP)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ14/2006(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403859|gb|EU798848| /Swine/5 (NP)/H1N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY08/2007(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403861|gb|EU798849| /Swine/5 (NP)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/CAS05/2004(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403863|gb|EU798850| /Swine/5 (NP)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAN04/2005(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403865|gb|EU798851| /Swine/5 (NP)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS07/2005(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403867|gb|EU798852| /Swine/5 (NP)/H3N2/South Korea/2006/// Influenza A virus (A/swine/Korea/CAS09/2006(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403869|gb|EU798853| /Swine/5 (NP)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY04/2007(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403871|gb|EU798854| /Swine/5 (NP)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY05/2007(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403873|gb|EU798855| /Swine/5 (NP)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY07/2007(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403875|gb|EU798856| /Swine/5 (NP)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY09/2007(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|190403877|gb|EU798857| /Swine/5 (NP)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY10/2007(H3N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|193245816|gb|EU850621| /Swine/5 (NP)/H1N2/China/2005/// Influenza A virus (A/swine/Guangxi/17/2005(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds.
gi|193245824|gb|EU850624| /Swine/5 (NP)/H1N2/China/2005/// Influenza A virus (A/swine/Hainan/1/2005(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds.
gi|209164824|gb|FJ357107| /Avian/5 (NP)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/17026/1988(H1N1)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|209486613|gb|FJ374515| /Swine/5 (NP)/H1N2/China/2007/03/24/ Influenza A virus (A/swine/Shanghai/1/2007(H1N2)) segment 5 nucleocapsid protein (NP) gene, complete cds
gi|438593|gb|L24394| /Human/5 (NP)/H1N1/USA/1991/// Influenza A virus (A/MD/12/1991(H1N1)) nucleoprotein (NP) gene, complete cds.

gi|324639|gb|M63755| /Human/5 (NP)/H1N1/USA/1988/// Influenza A virus (A/Wisconsin/3523/1988(H1N1)) nucleoprotein (NP) gene, complete cds.
gi|324666|gb|M63768| /Swine/5 (NP)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/17672/1988(H1N1)) nucleoprotein (NP) gene, complete cds.
gi|325088|gb|M76608| /Swine/5 (NP)/H1N1/USA/1988/// Influenza A virus (A/swine/Wisconsin/1915/1988(H1N1)) nucleoprotein mRNA, complete cds.
gi|1912380|gb|U49091| /Swine/5 (NP)/H1N1/China/1991/// Influenza A virus (A/swine/Beijing/94/1991(H1N1)) nucleoprotein (NP) mRNA, complete cds.
gi|227809831|gb|FJ966083| /Human/5 (NP)/H1N1/USA/2009/04/01/ Influenza A virus (A/California/04/2009(H1N1)) segment 5 nucleocapsid protein (NP) gene, complete cds

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gi|3722192|gb|AF038271| /Human/7 (MP)/H3N2/Japan/1996/// Influenza A virus H3N2 A/Niigata/137/96 matrix protein M1 and transmembrane ion channel M2 protein (M) gene, complete cds.
gi|91127728|gb|CY010653| /Human/7 (MP)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/611/1995(H3N2)) segment 7, complete sequence
gi|106896312|gb|CY010661| /Human/7 (MP)/H3N2/USA/1995/12/19/ Influenza A virus (A/New York/612/1995(H3N2)) segment 7, complete sequence
gi|106896313|gb|CY010669| /Human/7 (MP)/H3N2/USA/1996/01/10/ Influenza A virus (A/New York/613/1996(H3N2)) segment 7, complete sequence
gi|91129948|gb|CY010709| /Human/7 (MP)/H3N2/USA/1995/12/12/ Influenza A virus (A/New York/628/1995(H3N2)) segment 7, complete sequence
gi|131052303|gb|CY010725| /Human/7 (MP)/H3N2/USA/1995/12/08/ Influenza A virus (A/New York/634/1995(H3N2)) segment 7, complete sequence
gi|94959629|gb|CY010813| /Human/7 (MP)/H3N2/USA/1995/12/29/ Influenza A virus (A/New York/623/1995(H3N2)) segment 7, complete sequence
gi|109675495|gb|CY011449| /Human/7 (MP)/H3N2/USA/1996/01/18/ Influenza A virus (A/New York/635/1996(H3N2)) segment 7, complete sequence
gi|109675533|gb|CY011465| /Human/7 (MP)/H3N2/USA/1996/01/03/ Influenza A virus (A/New York/641/1996(H3N2)) segment 7, complete sequence
gi|110629730|gb|CY012745| /Human/7 (MP)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/771/1993(H3N2)) segment 7, complete sequence
gi|110629768|gb|CY012761| /Human/7 (MP)/H3N2/USA/1993/03/20/ Influenza A virus (A/New York/777/1993(H3N2)) segment 7, complete sequence
gi|110733708|gb|CY012969| /Human/7 (MP)/H3N2/USA/1994/01/14/ Influenza A virus (A/New York/735/1994(H3N2)) segment 7, complete sequence
gi|112789109|gb|CY013678| /Human/7 (MP)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/784/1993(H3N2)) segment 7, complete sequence
gi|112789166|gb|CY013702| /Human/7 (MP)/H3N2/USA/1993/04/05/ Influenza A virus (A/New York/789/1993(H3N2)) segment 7, complete sequence
gi|112789318|gb|CY013766| /Human/7 (MP)/H3N2/USA/1993/03/10/ Influenza A virus (A/New York/799/1993(H3N2)) segment 7, complete sequence
gi|115521542|gb|CY016484| /Human/7 (MP)/H3N2/USA/1993/03/11/ Influenza A virus (A/New York/800/1993(H3N2)) segment 7, complete sequence
gi|3929605|gb|U65573| /Human/7 (MP)/H3N2/Japan/1995/// Influenza A virus H3N2 strain A/Shiga/20/95 M1 protein and M2 protein genes, complete cds.
gi|3929611|gb|U65577| /Human/7 (MP)/H3N2/Japan/1995/// Influenza A virus H3N2 strain A/Miyagi/29/95 M1 protein and M2 protein genes, complete cds.

Swine, NA, 48 sequences

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gi|9887135|gb|AF251406| /Swine/7 (MP)/H3N2/USA/1998/// Influenza A virus (A/Swine/Nebraska/209/98 (H3N2)) matrix protein 1 (M1) gene, complete cds.
gi|9887152|gb|AF251414| /Swine/7 (MP)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/533/99 (H3N2)) matrix protein 1 (M1) gene, complete cds.
gi|9887186|gb|AF251430| /Swine/7 (MP)/H3N2/USA/1999/// Influenza A virus (A/Swine/Minnesota/593/99 (H3N2)) matrix protein 1 (M1) gene, complete cds.
gi|29539572|gb|AF342818| /Human/7 (MP)/H1N1/USA/1998/// Influenza A virus (A/Wisconsin/10/98 (H1N1)) membrane protein M1 and membrane protein M2 genes, complete cds
gi|30522965|gb|AY233392| /Avian/7 (MP)/H1N2/USA/2001/// Influenza A virus (A/duck/NC/91347/01(H1N2)) matrix protein 1 (M1) gene, complete cds

gi|149785305|gb|CY022318| /Swine/7 (MP)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/1/1985(H1N1)) segment 7, complete sequence
gi|149785255|gb|CY022326| /Swine/7 (MP)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/3/1985(H1N1)) segment 7, complete sequence
gi|149785183|gb|CY022334| /Swine/7 (MP)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/17672/1988(H1N1)) segment 7, complete sequence
gi|149785125|gb|CY022430| /Swine/7 (MP)/H1N1/USA/1988/// Influenza A virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 7, complete sequence
gi|149785052|gb|CY022470| /Swine/7 (MP)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3228/1987(H1N1)) segment 7, complete sequence
gi|149784972|gb|CY022478| /Swine/7 (MP)/H1N1/USA/1991/// Influenza A virus (A/swine/Maryland/23239/1991(H1N1)) segment 7, complete sequence
gi|152963530|gb|CY022971| /Swine/7 (MP)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/31483/1988(H1N1)) segment 7, complete sequence
gi|156536560|gb|CY024926| /Human/7 (MP)/H1N1/USA/1988/// Influenza A virus (A/Ohio/3559/1988(H1N1)) segment 7, complete sequence
gi|156536596|gb|CY025011| /Swine/7 (MP)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3024/1987(H1N1)) segment 7, complete sequence
gi|158525297|gb|CY027156| /Swine/7 (MP)/H1N1/USA/1991/// Influenza A virus (A/swine/Iowa/24297/1991(H1N1)) segment 7, complete sequence
gi|158958059|gb|CY027508| /Swine/7 (MP)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/2/1985(H1N1)) segment 7, complete sequence
gi|166203490|gb|CY028781| /Swine/7 (MP)/H1N1/USA/1991/// Influenza A virus (A/swine/California/T9001707/1991(H1N1)) segment 7, complete sequence
gi|208400880|gb|CY035071| /Swine/7 (MP)/H1N1/USA/1990/// Influenza A virus (A/swine/Memphis/1/1990(H1N1)) segment 7, complete sequence
gi|229807654|gb|CY039918| /Swine/7 (MP)/H1N1/USA/1988/// Influenza A Virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 7, complete sequence
gi|229809514|gb|CY039926| /Swine/7 (MP)/H1N1/USA/1988/// Influenza A Virus (A/swine/Indiana/1726/1988(H1N1)) segment 7, complete sequence
gi|75756555|gb|DQ150428| /Swine/7 (MP)/H3N1/USA/2004/// Influenza A virus (A/swine/MI/PU243/04 (H3N1)) matrix (M1) gene, complete cds.
gi|75756571|gb|DQ150436| /Swine/7 (MP)/H3N1/USA/2004/// Influenza A virus (A/swine/IN/PU542/04 (H3N1)) matrix (M1) gene, complete cds.
gi|84626337|gb|DQ335772| /Avian/7 (MP)/H3N2/USA/2004/// Influenza A virus (A/turkey/Ohio/313053/04(H3N2)) membrane protein (M) gene, complete cds
gi|94404595|gb|DQ469961| /Human/7 (MP)/H3N2/Canada/2005/// Influenza A virus (A/Ontario/RV1273/2005(H3N2)) matrix protein 2 (MP2) and matrix protein 1 (MP1) genes, complete cds
gi|94404598|gb|DQ469969| /Swine/7 (MP)/H3N2/Canada/2005/// Influenza A virus (A/swine/Alberta/14722/2005(H3N2)) matrix protein 2 (MP2) and matrix protein 1 (MP1) genes, complete cds
gi|94404601|gb|DQ469977| /Swine/7 (MP)/H3N2/Canada/2005/// Influenza A virus (A/swine/British Columbia/28103/2005(H3N2)) matrix protein 2 (MP2) and matrix protein 1 (MP1) genes, complete cds
gi|94404604|gb|DQ469985| /Swine/7 (MP)/H3N2/Canada/2005/// Influenza A virus (A/swine/Manitoba/12707/2005(H3N2)) matrix protein 2 (MP2) and matrix protein 1 (MP1) genes, complete cds
gi|94404607|gb|DQ469993| /Swine/7 (MP)/H3N2/Canada/2005/// Influenza A virus (A/swine/Ontario/33853/2005(H3N2)) matrix protein 2 (MP2) and matrix protein 1 (MP1) genes, complete cds
gi|94404610|gb|DQ470001| /Avian/7 (MP)/H3N2/Canada/2005/// Influenza A virus (A/turkey/Ontario/31232/2005(H3N2)) matrix protein 2 (MP2) and matrix protein 1 (MP1) genes, complete cds
gi|109156216|gb|DQ666934| /Swine/7 (MP)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/S11/2005(H1N2)) matrix protein 2 and matrix protein 1 genes, complete cds.
gi|112456284|gb|DQ889688| /Human/7 (MP)/H1N1/USA/2005/// Influenza A virus (A/Iowa/CEID23/2005(H1N1)) matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds
gi|146454453|gb|EF551048| /Avian/7 (MP)/H3N2/USA/2004/// Influenza A virus (A/turkey/Illinois/2004(H3N2)) matrix protein 2 (MP2) and matrix protein 1 (MP1) genes, complete cds.

gi|146454471|gb|EF551056| /Swine/7 (MP)/H3N2/USA/2003/// Influenza A virus (A/swine/North Carolina/2003(H3N2)) matrix protein 2 (MP2) and matrix protein 1 (MP1) genes, complete cds.
gi|151175877|gb|EU015989| /Swine/7 (MP)/H1N2/China/2006/// Influenza A virus (A/swine/Guangxi/13/2006(H1N2)) matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds.
gi|187763985|gb|EU697207| /Avian/7 (MP)/H3N2/USA/2005/// Influenza A virus (A/turkey/Minnesota/366767/2005(H3N2)) matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds
gi|189313197|gb|EU735787| /Avian/7 (MP)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/19762/1988(H1N1)) matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds.
gi|189313121|gb|EU735819| /Avian/7 (MP)/H3N2/USA/2004/// Influenza A virus (A/turkey/OH/313053/2004(H3N2)) matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds
gi|189313102|gb|EU735827| /Avian/7 (MP)/H3N2/USA/2005/// Influenza A virus (A/turkey/NC/353568/2005(H3N2)) matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds
gi|193877861|gb|EU743152| /Avian/7 (MP)/H1N1/USA/1990/// Influenza A virus (A/turkey/IA/10271-3/1990(H1N1)) segment 7 matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds.
gi|193877843|gb|EU743160| /Avian/7 (MP)/H1N1/USA/1992/// Influenza A virus (A/turkey/IA/21089-3/1992(H1N1)) segment 7 matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds.
gi|193877757|gb|EU743211| /Avian/7 (MP)/H3N2/USA/2005/// Influenza A virus (A/turkey/MN/366767/2005(H3N2)) segment 7 matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds.
gi|192382745|gb|EU826546| /Swine/7 (MP)/H3N2/Canada/2005/07/12/ Influenza A virus (A/swine/Quebec/4001/2005(H3N2)) segment 7 matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds
gi|193245818|gb|EU850622| /Swine/7 (MP)/H1N2/China/2005/// Influenza A virus (A/swine/Guangxi/17/2005(H1N2)) segment 7 matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds.
gi|193245826|gb|EU850625| /Swine/7 (MP)/H1N2/China/2005/// Influenza A virus (A/swine/Hainan/1/2005(H1N2)) segment 7 matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds.
gi|209164819|gb|FJ357105| /Avian/7 (MP)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/17026/1988(H1N1)) segment 7 matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds
gi|209486620|gb|FJ374518| /Swine/7 (MP)/H1N2/China/2007/03/24/ Influenza A virus (A/swine/Shanghai/1/2007(H1N2)) segment 7 matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds
gi|1399614|gb|U53168| /Human/7 (MP)/H1N1/USA/1994/// Influenza A virus (A/WI/4754/1994(H1N1)) M (M) mRNA, complete cds
gi|1399616|gb|U53169| /Human/7 (MP)/H1N1/USA/1994/// Influenza A virus (A/WI/4755/1994(H1N1)) M (M) mRNA, complete cds

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gi|216409291|gb|AB434323| /Swine/7 (MP)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/NIAH589/2005(H1N1)) M1, M2 genes for matrix protein 1, matrix protein 2, complete cds
gi|216409309|gb|AB434331| /Swine/7 (MP)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chachoengsao/NIAH587/2005(H1N1)) M1, M2 genes for matrix protein 1, matrix protein 2, complete cds
gi|14275700|gb|AJ293925| /Human/7 (MP)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) m1 gene for matrix protein 1 and m2 gene for matrix protein 2, genomic RNA
gi|14275727|gb|AJ293938| /Swine/7 (MP)/H3N2/Italy/1998/// Influenza A virus (A/swine/Italy/1553-2/98(H3N2)) m1 gene for matrix protein 1 and m2 gene for matrix protein 2, genomic RNA
gi|20068098|gb|AJ316049| /Swine/7 (MP)/H1N2/France/1997/// Influenza A virus (A/swine/Cotes d'Armor/790/97(H1N2)) M1 gene for matrix protein and M2 gene for matrix protein 2, genomic RNA
gi|20068107|gb|AJ316052| /Swine/7 (MP)/H1N2/Italy/1998/// Influenza A virus (A/swine/Italy/1521/98(H1N2)) M1 gene for matrix protein 1 and M2 gene for matrix protein 2, genomic RNA
gi|20068128|gb|AJ316059| /Swine/7 (MP)/H1N1/France/1982/// Influenza A virus (A/swine/Finistere/2899/82(H1N1) M1 gene for matrix protein 1 and M2 gene for matrix protein 2, genomic RNA
gi|212290249|gb|AM157374| /Avian/7 (MP)/H1N1/France/1987/// Influenza A virus (A/turkey/France/87075/87(H1N1)) M1 gene for matrix protein 1 and M2 gene for matrix protein 2, genomic RNA
gi|164511472|gb|AM746618| /Swine/7 (MP)/H3N2/Germany/2006/// Influenza A virus (A/wild boar/Germany/WS169/2006(H3N2)) M1 gene for matrix protein 1, genomic RNA

gi|31747408|gb|AY300952| /Avian/7 (MP)/H5N2/USA/1998/// Influenza A virus (A/chukar/MN/14591-7/1998(H5N2)) membrane protein (M) gene, complete cds
gi|78097307|gb|CY005494| /Avian/7 (MP)/H7N1/China/1992/// Influenza A virus (A/duck/Nanchang/1904/1992(H7N1)) segment 7, complete sequence
gi|78097595|gb|CY005606| /Avian/7 (MP)/H6N1/Hong Kong/1977/// Influenza A virus (A/chicken/Hong Kong/17/1977(H6N1)) segment 7, complete sequence
gi|89148254|gb|CY009373| /Swine/7 (MP)/H3N2/Spain/2001/// Influenza A virus (A/swine/Spain/33601/2001(H3N2)) segment 7, complete sequence
gi|89148097|gb|CY009381| /Swine/7 (MP)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/39139/2002(H3N2)) segment 7, complete sequence
gi|89789280|gb|CY009893| /Swine/7 (MP)/H1N1/Spain/2003/// Influenza A virus (A/Swine/Spain/50047/2003(H1N1)) segment 7, complete sequence
gi|91177908|gb|CY010565| /Swine/7 (MP)/H3N2/Spain/2004/// Influenza A virus (A/swine/Spain/54008/2004(H3N2)) segment 7, complete sequence
gi|91125696|gb|CY010573| /Swine/7 (MP)/H1N1/Spain/2003/// Influenza A virus (A/swine/Spain/51915/2003(H1N1)) segment 7, complete sequence
gi|91177889|gb|CY010581| /Swine/7 (MP)/H1N1/Spain/2004/// Influenza A virus (A/swine/Spain/53207/2004(H1N1)) segment 7, complete sequence
gi|133981500|gb|CY020502| /Swine/7 (MP)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/42386/2002(H3N2)) segment 7, complete sequence
gi|77632737|gb|DQ186973| /Swine/7 (MP)/H1N1/Germany/1981/// Influenza A virus (A/swine/Potsdam/15/81(H1N1)) M2 protein and M1 protein genes, complete cds.
gi|77632740|gb|DQ186974| /Swine/7 (MP)/H1N1/Germany/1989/// Influenza A virus (A/swine/Schwerin/103/89(H1N1)) M2 protein and M1 protein genes, complete cds.
gi|77632743|gb|DQ186975| /Swine/7 (MP)/H1N1/Germany/1995/// Influenza A virus (A/swine/Bakum/5/95(H1N1)) M2 protein and M1 protein genes, complete cds.
gi|77632746|gb|DQ186976| /Swine/7 (MP)/H1N1/Germany/2001/// Influenza A virus (A/swine/Belzig/2/2001(H1N1)) M2 protein and M1 protein genes, complete cds.
gi|77632749|gb|DQ186977| /Swine/7 (MP)/H1N2/Germany/2000/// Influenza A virus (A/swine/Bakum/1832/00(H1N2)) M2 protein and M1 protein genes, complete cds.
gi|77632752|gb|DQ186978| /Swine/7 (MP)/H1N2/Germany/2000/// Influenza A virus (A/swine/Bakum/1833/00(H1N2)) M2 protein and M1 protein genes, complete cds.
gi|77632755|gb|DQ186979| /Swine/7 (MP)/H3N2/Germany/1982/// Influenza A virus (A/swine/Potsdam/35/82(H3N2)) M2 protein and M1 protein genes, complete cds.
gi|77632761|gb|DQ186981| /Swine/7 (MP)/H3N2/Germany/1992/// Influenza A virus (A/swine/Leipzig/145/92(H3N2)) M2 protein and M1 protein genes, complete cds.
gi|77632764|gb|DQ186982| /Swine/7 (MP)/H3N2/Germany/1996/// Influenza A virus (A/swine/Jena/5/96(H3N2)) M2 protein and M1 protein genes, complete cds
gi|77632767|gb|DQ186983| /Swine/7 (MP)/H3N2/Germany/1997/// Influenza A virus (A/swine/Lohne/1/97(H3N2)) M2 protein and M1 protein genes, complete cds.
gi|77632770|gb|DQ186984| /Swine/7 (MP)/H3N2/Germany/1999/// Influenza A virus (A/swine/Bakum/8602/99(H3N2)) M2 protein and M1 protein genes, complete cds.
gi|85692677|gb|DQ351858| /Avian/7 (MP)/H5N1/China/2001/// Influenza A virus (A/chicken/Hebei/718/2001(H5N1)) segment 7 membrane ion channel 2 (M) and matrix protein 1 (M) genes, complete cds
gi|117935798|gb|EF101742| /Human/7 (MP)/H1N2/Philippines/2004/02/27/ Influenza A virus (A/Philippines/344/2004(H1N2)) matrix protein gene, complete cds
gi|117935800|gb|EF101750| /Human/7 (MP)/H1N1/Thailand/2005/07/14/ Influenza A virus (A/Thailand/271/2005(H1N1)) matrix protein gene, complete cds
gi|153957968|gb|EU053136| /Swine/7 (MP)/H1N2/Germany/2005/12/07/ Influenza A virus (A/swine/Doetlingen/IDT4735/2005(H1N2)) segment 7 M2 membrane protein and M1 matrix protein genes, complete cds.
gi|153958075|gb|EU053144| /Swine/7 (MP)/H1N2/Germany/2005/12/13/ Influenza A virus (A/swine/Cloppenburg/IDT4777/2005(H1N2)) segment 7 M2 membrane protein and M1 matrix protein genes, complete cds.

gi|157366776|gb|EU152199| /Swine/7 (MP)/H3N2/Thailand/2004/// Influenza A virus (A/swine/Thailand/KU7-2/2004(H3N2)) M2 protein gene, partial cds; and M1 protein gene, complete cds
gi|210076640|gb|FJ415612| /Swine/7 (MP)/H1N1/China/2007/11/15/ Influenza A virus (A/swine/Zhejiang/1/2007(H1N1)) segment 7 matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds
gi|211996954|gb|FJ432779| /Avian/7 (MP)/H1N1/Italy/2003/// Influenza A virus (A/goose/Italy/296426/2003(H1N1)) segment 7 matrix protein 2 (M2) gene, partial cds; and matrix protein 1 (M1) gene, complete cds
gi|324279|gb|M55478| /Swine/7 (MP)/H1N1/Germany/1981/// Influenza A virus (A/swine/Germany/2/1981(H1N1)) M2 matrix protein and M1 matrix protein genes, complete cds
gi|324381|gb|M63525| /Swine/7 (MP)/H1N1/Netherlands/1985/// Influenza virus type A (strain A/swine/Netherlands/12/85 (H1N1) membrane protein M1 and membrane protein M2 genes, complete cds.
gi|438073|gb|Z26859| /Avian/7 (MP)/H1N1/Germany/1991/// Influenza A virus(A/turkey/Germany/3/91(H1N1)) M and M2 genes for matrix proteins
gi|438079|gb|Z26861| /Swine/7 (MP)/H1N1/Germany/1991/// Influenza A virus(A/swine/Germany/8533/91(H1N1)) M and M2 genes for matrix proteins
gi|438082|gb|Z26862| /Swine/7 (MP)/H1N1/Netherlands/1980/// Influenza A virus(A/swine/Netherlands/25/80(H1N1)) M and M2 genes for matrix proteins
gi|227977107|gb|FJ969513| /Human/7 (MP)/H1N1/USA/2009/04/01/ Influenza A virus (A/California/04/2009(H1N1)) segment 7 matrix protein 2 (M2) and matrix protein 1 (M1) genes, complete cds

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gi|3722207|gb|AF038276| /Human/8 (NS)/H3N2/Japan/1996/// Influenza A virus H3N2 A/Niigata/137/96 nonstructural proteins NS1 and NS2 (NS) gene, complete cds
gi|91127735|gb|CY010656| /Human/8 (NS)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/611/1995(H3N2)) segment 8, complete sequence
gi|91127783|gb|CY010664| /Human/8 (NS)/H3N2/USA/1995/12/19/ Influenza A virus (A/New York/612/1995(H3N2)) segment 8, complete sequence
gi|91128192|gb|CY010672| /Human/8 (NS)/H3N2/USA/1996/01/10/ Influenza A virus (A/New York/613/1996(H3N2)) segment 8, complete sequence
gi|91128568|gb|CY010680| /Human/8 (NS)/H3N2/USA/1995/12/28/ Influenza A virus (A/New York/618/1995(H3N2)) segment 8, complete sequence
gi|91129977|gb|CY010712| /Human/8 (NS)/H3N2/USA/1995/12/12/ Influenza A virus (A/New York/628/1995(H3N2)) segment 8, complete sequence
gi|91130740|gb|CY010728| /Human/8 (NS)/H3N2/USA/1995/12/08/ Influenza A virus (A/New York/634/1995(H3N2)) segment 8, complete sequence
gi|94959636|gb|CY010816| /Human/8 (NS)/H3N2/USA/1995/12/29/ Influenza A virus (A/New York/623/1995(H3N2)) segment 8, complete sequence
gi|109675464|gb|CY011436| /Human/8 (NS)/H3N2/USA/1996/02/16/ Influenza A virus (A/New York/624/1996(H3N2)) segment 8, complete sequence
gi|109675502|gb|CY011452| /Human/8 (NS)/H3N2/USA/1996/01/18/ Influenza A virus (A/New York/635/1996(H3N2)) segment 8, complete sequence
gi|109675540|gb|CY011468| /Human/8 (NS)/H3N2/USA/1996/01/03/ Influenza A virus (A/New York/641/1996(H3N2)) segment 8, complete sequence
gi|109914695|gb|CY011892| /Human/8 (NS)/H3N2/USA/1994/01/17/ Influenza A virus (A/New York/716/1994(H3N2)) segment 8, complete sequence
gi|110333427|gb|CY012220| /Human/8 (NS)/H3N2/USA/1995/12/18/ Influenza A virus (A/New York/639/1995(H3N2)) segment 8, complete sequence
gi|110629737|gb|CY012748| /Human/8 (NS)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/771/1993(H3N2)) segment 8, complete sequence
gi|110629775|gb|CY012764| /Human/8 (NS)/H3N2/USA/1993/03/20/ Influenza A virus (A/New York/777/1993(H3N2)) segment 8, complete sequence
gi|110733715|gb|CY012972| /Human/8 (NS)/H3N2/USA/1994/01/14/ Influenza A virus (A/New York/735/1994(H3N2)) segment 8, complete sequence
gi|112789116|gb|CY013681| /Human/8 (NS)/H3N2/USA/1993/04/19/ Influenza A virus (A/New York/784/1993(H3N2)) segment 8, complete sequence
gi|112789173|gb|CY013705| /Human/8 (NS)/H3N2/USA/1993/04/05/ Influenza A virus (A/New York/789/1993(H3N2)) segment 8, complete sequence
gi|112789325|gb|CY013769| /Human/8 (NS)/H3N2/USA/1993/03/10/ Influenza A virus (A/New York/799/1993(H3N2)) segment 8, complete sequence
gi|115521549|gb|CY016487| /Human/8 (NS)/H3N2/USA/1993/03/11/ Influenza A virus (A/New York/800/1993(H3N2)) segment 8, complete sequence
gi|3929411|gb|U65673| /Human/8 (NS)/H3N2/Japan/1995/// Influenza A virus H3N2 strain A/Shiga/20/95 nonstructural protein 1 and nonstructural protein 2 mRNAs, complete cds.

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gi|216409294|gb|AB434324| /Swine/8 (NS)/H1N1/Thailand/2005/// Influenza A virus (A/swine/Chonburi/NIAH589/2005(H1N1)) NS1, NS2 genes for nonstructural protein 1, nonstructural protein 2, complete cds
gi|216409312|gb|AB434332| /Swine/8 (NS)/H1N1/Thailand/2005/// Influenza A virus

(A/swine/Chachoengsao/NIAH587/2005(H1N1)) NS1, NS2 genes for nonstructural protein 1, nonstructural protein 2, complete cds
gi|14275736|gb|AJ293941| /Human/8 (NS)/H3N2/Hong Kong/1999/// Influenza A virus (A/Hong Kong/1774/99(H3N2)) ns1 gene for nonstructural protein 1 and ns2 gene for nonstructural protein 2, genomic RNA
gi|20068152|gb|AJ344026| /Swine/8 (NS)/H1N2/France/1997/// Influenza A virus (A/swine/Cotes d'Armor/790/97(H1N2)) NS1 gene for non structural protein 1 and NS2 gene for non structural protein 2, genomic RNA
gi|20068158|gb|AJ344028| /Swine/8 (NS)/H1N2/Italy/1998/// Influenza A virus (A/swine/Italy/1521/98(H1N2)) NS1 gene for non structural protein 1 and NS2 gene for non structural protein 2, genomic RNA
gi|20068185|gb|AJ344037| /Swine/8 (NS)/H1N1/France/1982/// Influenza A virus (A/swine/Finistere/2899/82(H1N1)) NS1 gene for non structural protein 1 and NS2 gene for non structural protein 2, genomic RNA
gi|20068188|gb|AJ344038| /Swine/8 (NS)/H1N1/France/1999/// Influenza A virus (A/swine/Cotes d'Armor/1482/99(H1N1)) NS1 gene for non structural protein 1 and NS2 gene for non structural protein 2, genomic RNA
gi|18075004|gb|AJ410596| /Avian/8 (NS)/H6N1/Hong Kong/1977/// Influenza A virus genomic RNA for nonstructural protein 1 (ns gene) strain A/duck/Hong Kong/175/77 (H6N1)
gi|164511476|gb|AM746620| /Swine/8 (NS)/H3N2/Germany/2006/// Influenza A virus (A/wild boar/Germany/WS169/2006(H3N2)) NS1 gene for nonstructural protein 1, genomic RNA
gi|159149081|gb|AY300976| /Avian/8 (NS)/H5N2/USA/1998/// Influenza A virus (A/chukar/MN/14591-7/1998(H5N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|38154983|gb|AY363591| /Swine/8 (NS)/H3N2/Hong Kong/1999/// Influenza A virus (A/swine/Hong Kong/5190/99(H3N2)) non-structural protein NS2 and non-structural protein NS1 (NS) gene, complete cds.
gi|38154986|gb|AY363592| /Swine/8 (NS)/H3N2/Hong Kong/1999/// Influenza A virus (A/swine/Hong Kong/5200/99(H3N2)) non-structural protein NS2 and non-structural protein NS1 (NS) gene, complete cds.
gi|38154989|gb|AY363593| /Swine/8 (NS)/H3N2/Hong Kong/1999/// Influenza A virus (A/swine/Hong Kong/5212/99(H3N2)) non-structural protein NS2 and non-structural protein NS1 (NS) gene, complete cds.
gi|38154992|gb|AY363594| /Swine/8 (NS)/H3N2/Hong Kong/2000/// Influenza A virus (A/swine/Hong Kong/7982/00(H3N2)) non-structural protein NS2 and non-structural protein NS1 (NS) gene, complete cds.
gi|38154995|gb|AY363595| /Swine/8 (NS)/H3N2/Hong Kong/2001/// Influenza A virus (A/swine/Hong Kong/9296/01(H3N2)) non-structural protein NS2 and non-structural protein NS1 (NS) gene, complete cds.
gi|38154998|gb|AY363596| /Swine/8 (NS)/H3N2/Hong Kong/2001/// Influenza A virus (A/swine/Hong Kong/9745/01(H3N2)) non-structural protein NS2 and non-structural protein NS1 (NS) gene, complete cds.
gi|38155001|gb|AY363597| /Swine/8 (NS)/H3N2/Hong Kong/2002/// Influenza A virus (A/swine/Hong Kong/1144/02(H3N2)) non-structural protein NS2 and non-structural protein NS1 (NS) gene, complete cds.
gi|38155004|gb|AY363598| /Swine/8 (NS)/H3N2/Hong Kong/2002/// Influenza A virus (A/swine/Hong Kong/1197/02(H3N2)) non-structural protein NS2 and non-structural protein NS1 (NS) gene, complete cds.
gi|78097314|gb|CY005497| /Avian/8 (NS)/H7N1/China/1992/// Influenza A virus (A/duck/Nanchang/1904/1992(H7N1)) segment 8, complete sequence
gi|78097602|gb|CY005609| /Avian/8 (NS)/H6N1/Hong Kong/1977/// Influenza A virus (A/chicken/Hong Kong/17/1977(H6N1)) segment 8, complete sequence
gi|89148261|gb|CY009376| /Swine/8 (NS)/H3N2/Spain/2001/// Influenza A virus (A/swine/Spain/33601/2001(H3N2)) segment 8, complete sequence
gi|89148104|gb|CY009384| /Swine/8 (NS)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/39139/2002(H3N2)) segment 8, complete sequence
gi|89789287|gb|CY009896| /Swine/8 (NS)/H1N1/Spain/2003/// Influenza A virus (A/Swine/Spain/50047/2003(H1N1)) segment 8, complete sequence
gi|91177915|gb|CY010568| /Swine/8 (NS)/H3N2/Spain/2004/// Influenza A virus (A/swine/Spain/54008/2004(H3N2)) segment 8, complete sequence
gi|91125703|gb|CY010576| /Swine/8 (NS)/H1N1/Spain/2003/// Influenza A virus (A/swine/Spain/51915/2003(H1N1)) segment 8, complete sequence
gi|91177896|gb|CY010584| /Swine/8 (NS)/H1N1/Spain/2004/// Influenza A virus (A/swine/Spain/53207/2004(H1N1)) segment 8, complete sequence
gi|133981531|gb|CY020505| /Swine/8 (NS)/H3N2/Spain/2002/// Influenza A virus (A/swine/Spain/42386/2002(H3N2)) segment 8, complete sequence

gi|85692692|gb|DQ351863| /Avian/8 (NS)/H5N1/China/2001/// Influenza A virus (A/chicken/Hebei/718/2001(H5N1)) segment 8 nonstructural protein 2 (NS) and nonstructural protein 1 (NS) genes, complete cds.
gi|153957981|gb|EU053137| /Swine/8 (NS)/H1N2/Germany/2005/12/07/ Influenza A virus (A/swine/Doetlingen/IDT4735/2005(H1N2)) segment 8 NS2/NEP and NS1 genes, complete cds.
gi|153958095|gb|EU053145| /Swine/8 (NS)/H1N2/Germany/2005/12/13/ Influenza A virus (A/swine/Cloppenburg/IDT4777/2005(H1N2)) segment 8 NS2/NEP and NS1 genes, complete cds.
gi|210076643|gb|FJ415613| /Swine/8 (NS)/H1N1/China/2007/11/15/ Influenza A virus (A/swine/Zhejiang/1/2007(H1N1)) segment 8 nuclear export protein (NEP) gene, complete cds; and nonfunctional nonstructural protein 1 (NS1) gene, complete sequence
gi|211996961|gb|FJ432782| /Avian/8 (NS)/H1N1/Italy/2003/// Influenza A virus (A/goose/Italy/296426/2003(H1N1)) segment 8 nuclear export protein (NEP) and nonstructural protein 1 (NS1) genes, complete cds
gi|324765|gb|M55484| /Swine/8 (NS)/H1N1/Germany/1981/// Influenza A virus (A/swine/Germany/2/1981(H1N1)) nonstructural protein 2 and nonstructural protein 1, complete cds
gi|438091|gb|Z26863| /Avian/8 (NS)/H1N1/Germany/1991/// Influenza A virus(A/turkey/Germany/3/91(H1N1)) NS1 and NS2 genes for nonstructural proteins
gi|438097|gb|Z26865| /Swine/8 (NS)/H1N1/Germany/1991/// Influenza A virus(A/swine/Germany/8533/91(H1N1)) NS1 and NS2 genes for nonstructural proteins
gi|438100|gb|Z26866| /Swine/8 (NS)/H1N1/Netherlands/1980/// Influenza A virus(A/swine/Netherlands/25/80(H1N1)) NS1 and NS2 genes for nonstructural proteins

Swine, NA, 28 sequences
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gi|149785313|gb|CY022321| /Swine/8 (NS)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/1/1985(H1N1)) segment 8, complete sequence
gi|149785264|gb|CY022329| /Swine/8 (NS)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/3/1985(H1N1)) segment 8, complete sequence
gi|149785191|gb|CY022337| /Swine/8 (NS)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/17672/1988(H1N1)) segment 8, complete sequence
gi|149785133|gb|CY022433| /Swine/8 (NS)/H1N1/USA/1988/// Influenza A virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 8, complete sequence
gi|149785060|gb|CY022473| /Swine/8 (NS)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3228/1987(H1N1)) segment 8, complete sequence
gi|149784980|gb|CY022481| /Swine/8 (NS)/H1N1/USA/1991/// Influenza A virus (A/swine/Maryland/23239/1991(H1N1)) segment 8, complete sequence
gi|152963537|gb|CY022974| /Swine/8 (NS)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/31483/1988(H1N1)) segment 8, complete sequence
gi|156536567|gb|CY024929| /Human/8 (NS)/H1N1/USA/1988/// Influenza A virus (A/Ohio/3559/1988(H1N1)) segment 8, complete sequence
gi|156536603|gb|CY025014| /Swine/8 (NS)/H1N1/USA/1987/// Influenza A virus (A/swine/Kansas/3024/1987(H1N1)) segment 8, complete sequence
gi|158525304|gb|CY027159| /Swine/8 (NS)/H1N1/USA/1991/// Influenza A virus (A/swine/Iowa/24297/1991(H1N1)) segment 8, complete sequence
gi|158958066|gb|CY027511| /Swine/8 (NS)/H1N1/USA/1985/// Influenza A virus (A/swine/Iowa/2/1985(H1N1)) segment 8, complete sequence
gi|166203497|gb|CY028784| /Swine/8 (NS)/H1N1/USA/1991/// Influenza A virus (A/swine/California/T9001707/1991(H1N1)) segment 8, complete sequence
gi|208400887|gb|CY035074| /Swine/8 (NS)/H1N1/USA/1990/// Influenza A virus (A/swine/Memphis/1/1990(H1N1)) segment 8, complete sequence
gi|229807661|gb|CY039921| /Swine/8 (NS)/H1N1/USA/1988/// Influenza A Virus (A/swine/Wisconsin/1915/1988(H1N1)) segment 8, complete sequence
gi|229809521|gb|CY039929| /Swine/8 (NS)/H1N1/USA/1988/// Influenza A Virus (A/swine/Indiana/1726/1988(H1N1)) segment 8, complete sequence
gi|117935808|gb|EF101751| /Human/8 (NS)/H1N1/Thailand/2005/07/14/ Influenza A virus

(A/Thailand/271/2005(H1N1)) nonstructural protein 1 gene, complete cds
gi|162414474|gb|EU143269| /Swine/8 (NS)/H3N2/Thailand/2004/// Influenza A virus (A/swine/Thailand/KU7-2/2004(H3N2)) NS1 gene, complete cds
gi|189313204|gb|EU735790| /Avian/8 (NS)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/19762/1988(H1N1)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds.
gi|193877856|gb|EU743155| /Avian/8 (NS)/H1N1/USA/1990/// Influenza A virus (A/turkey/IA/10271-3/1990(H1N1)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds.
gi|193877838|gb|EU743163| /Avian/8 (NS)/H1N1/USA/1992/// Influenza A virus (A/turkey/IA/21089-3/1992(H1N1)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds.
gi|190403924|gb|EU798873| /Swine/8 (NS)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY04/2007(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403927|gb|EU798874| /Swine/8 (NS)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY05/2007(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403933|gb|EU798876| /Swine/8 (NS)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY09/2007(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|209164826|gb|FJ357108| /Avian/8 (NS)/H1N1/USA/1988/// Influenza A virus (A/turkey/NC/17026/1988(H1N1)) segment 8 nuclear export protein (NEP) and nonstructural protein 1 (NS1) genes, complete cds
gi|348810|gb|M80964| /Swine/8 (NS)/H1N1/USA/1988/// Influenza A virus (A/swine/Iowa/17672/1988(H1N1)) nonstructural protein gene, complete cds
gi|348830|gb|M80974| /Human/8 (NS)/H1N1/USA/1988/// Influenza A virus (A/Wisconsin/3523/1988(H1N1)) nonstructural protein gene, complete cds
gi|1399618|gb|U53170| /Human/8 (NS)/H1N1/USA/1994/// Influenza A virus (A/WI/4754/1994(H1N1)) NS (NS) mRNA, complete cds
gi|1399620|gb|U53171| /Human/8 (NS)/H1N1/USA/1994/// Influenza A virus (A/WI/4755/1994(H1N1)) NS (NS) mRNA, complete cds

Swine, NA, 79 sequences
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gi|5764379|gb|AF153261| /Swine/8 (NS)/H3N2/USA/1998/// Influenza A virus (A/Swine/Texas/4199-2/98 (H3N2)) segment 8 NS1 and NS2 genes, complete cds.
gi|5764382|gb|AF153262| /Swine/8 (NS)/H3N2/USA/1998/// Influenza A virus (A/Swine/Minnesota/9088-2/98 (H3N2)) segment 8 NS1 and NS2 genes, complete cds.
gi|5764385|gb|AF153263| /Swine/8 (NS)/H3N2/USA/1998/// Influenza A virus (A/Swine/Iowa/8548-1/98) segment 8 NS1 and NS2 genes, complete cds.
gi|8515431|gb|AF250128| /Swine/8 (NS)/H1N2/USA/1999/// Influenza A virus (A/Swine/Indiana/9K035/99 (H1N2)) NS1 and NS2 genes, complete cds.
gi|9887139|gb|AF251408| /Swine/8 (NS)/H3N2/USA/1998/// Influenza A virus (A/Swine/Nebraska/209/98 (H3N2)) nonstructural protein (NS) gene, complete cds, alternatively spliced.
gi|9887156|gb|AF251416| /Swine/8 (NS)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/533/99 (H3N2)) nonstructural protein (NS) gene, complete cds, alternatively spliced.
gi|9887173|gb|AF251424| /Swine/8 (NS)/H3N2/USA/1999/// Influenza A virus (A/Swine/Iowa/569/99 (H3N2)) nonstructural protein (NS) gene, complete cds, alternatively spliced.
gi|9887190|gb|AF251432| /Swine/8 (NS)/H3N2/USA/1999/// Influenza A virus (A/Swine/Minnesota/593/99 (H3N2)) nonstructural protein (NS) gene, complete cds, alternatively spliced.
gi|29539569|gb|AF342817| /Human/8 (NS)/H1N1/USA/1998/// Influenza A virus (A/Wisconsin/10/98 (H1N1)) nonstructural protein 1 and nonstructural protein 2 genes, complete cds
gi|19422140|gb|AF455707| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/Swine/Ohio/891/01(H1N2)) nonstructural protein 1 and nonstructural protein 2 genes, complete cds.
gi|19422143|gb|AF455708| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/98225/01(H1N2)) nonstructural protein 1 and nonstructural protein 2 genes, complete cds.

gi|19422146|gb|AF455709| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/Swine/North Carolina/93523/01 (H1N2)) nonstructural protein 1 and nonstructural protein 2 genes, complete cds.
gi|19422149|gb|AF455710| /Swine/8 (NS)/H1N2/USA/2000/// Influenza A virus (A/Swine/Minnesota/55551/00 (H1N2)) nonstructural protein 1 and nonstructural protein 2 genes, complete cds
gi|19422152|gb|AF455711| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/Swine/Iowa/930/01(H1N2)) nonstructural protein 1 and nonstructural protein 2 genes, complete cds.
gi|19422155|gb|AF455712| /Swine/8 (NS)/H1N2/USA/2000/// Influenza A virus (A/Swine/Indiana/P12439/00 (H1N2)) nonstructural protein 1 and nonstructural protein 2 genes, complete cds.
gi|19422158|gb|AF455713| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100085A/01 (H1N2)) nonstructural protein 1 and nonstructural protein 2 genes, complete cds.
gi|19422161|gb|AF455714| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/Swine/Illinois/100084/01 (H1N2)) nonstructural protein 1 and nonstructural protein 2 genes, complete cds.
gi|19848301|gb|AY038021| /Avian/8 (NS)/H1N2/USA/1999/// Influenza A virus (A/Turkey/MO/24093/99(H1N2)) nonstructural protein (NS) gene, complete cds, alternatively spliced
gi|17224042|gb|AY060129| /Swine/8 (NS)/H1N2/USA/2000/// Influenza A virus (A/SW/MN/3327/00(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224044|gb|AY060130| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/SW/MN/22860-T/01(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224046|gb|AY060131| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/SW/MN/22860-S/01(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224050|gb|AY060133| /Swine/8 (NS)/H1N2/USA/2000/// Influenza A virus (A/SW/KS/13481-T/00(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224052|gb|AY060134| /Swine/8 (NS)/H1N2/USA/2000/// Influenza A virus (A/SW/KS/13481-S/00(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224054|gb|AY060135| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/SW/IN/14810-T/01(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224056|gb|AY060136| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/SW/IN/14810-S/01(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224060|gb|AY060138| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/SW/MN/16419/01(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224068|gb|AY060142| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/SW/MN/23124-T/01(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224070|gb|AY060143| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/SW/MN/23124-S/01(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224076|gb|AY060146| /Swine/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/SW/NE/18339/01(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224078|gb|AY060147| /Swine/8 (NS)/H1N2/USA/2000/// Influenza A virus (A/SW/MN/13130/00(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224080|gb|AY060148| /Swine/8 (NS)/H1N2/USA/2000/// Influenza A virus (A/SW/OH/7802/00(H1N2)) nonstructural protein (NS) gene, complete cds
gi|17224082|gb|AY060149| /Swine/8 (NS)/H1N2/USA/1999/// Influenza A virus (A/SW/NC/45319/99(H1N2)) nonstructural protein (NS) gene, complete cds
gi|24286081|gb|AY129160| /Swine/8 (NS)/H1N2/South Korea/2002/// Influenza A virus (A/Swine/Korea/CY02/02(H1N2)) nonstructural protein (NS) mRNA, complete cds
gi|30522960|gb|AY233390| /Avian/8 (NS)/H1N2/USA/2001/// Influenza A virus (A/duck/NC/91347/01(H1N2)) nonstructural protein 1 (NS1) and nonstructural protein 2 (NS2) genes, complete cds
gi|56159984|gb|AY779259| /Avian/8 (NS)/H3N2/USA/2003/// Influenza A virus (A/turkey/North Carolina/12344/03(H3N2)) nonstructural protein 2 and nonstructural protein 1 (NS) gene, complete cds
gi|56159987|gb|AY779260| /Avian/8 (NS)/H3N2/USA/2003/// Influenza A virus (A/turkey/Minnesota/764-2/03(H3N2)) nonstructural protein 2 and nonstructural protein 1 (NS) gene, complete cds
gi|76574385|gb|DQ145543| /Swine/8 (NS)/H3N1/USA/2004/// Influenza A virus (A/swine/Minnesota/00395/2004(H3N1)) NS1 gene, complete cds
gi|75756557|gb|DQ150429| /Swine/8 (NS)/H3N1/USA/2004/// Influenza A virus (A/swine/MI/PU243/04 (H3N1)) nonstructural protein (NS1) gene, complete cds.

gi|75756573|gb|DQ150437| /Swine/8 (NS)/H3N1/USA/2004/// Influenza A virus (A/swine/IN/PU542/04 (H3N1)) nonstructural protein (NS1) gene, complete cds.
gi|84626343|gb|DQ335775| /Avian/8 (NS)/H3N2/USA/2004/// Influenza A virus (A/turkey/Ohio/313053/04(H3N2)) nonstructural protein (NS) gene, complete cds
gi|94404637|gb|DQ469958| /Human/8 (NS)/H3N2/Canada/2005/// Influenza A virus (A/Ontario/RV1273/2005(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|94404640|gb|DQ469966| /Swine/8 (NS)/H3N2/Canada/2005/// Influenza A virus (A/swine/Alberta/14722/2005(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|94404643|gb|DQ469974| /Swine/8 (NS)/H3N2/Canada/2005/// Influenza A virus (A/swine/British Columbia/28103/2005(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|94404646|gb|DQ469982| /Swine/8 (NS)/H3N2/Canada/2005/// Influenza A virus (A/swine/Manitoba/12707/2005(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|94404649|gb|DQ469990| /Swine/8 (NS)/H3N2/Canada/2005/// Influenza A virus (A/swine/Ontario/33853/2005(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|94404652|gb|DQ469998| /Avian/8 (NS)/H3N2/Canada/2005/// Influenza A virus (A/turkey/Ontario/31232/2005(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|109501343|gb|DQ666937| /Swine/8 (NS)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/S11/2005(H1N2)) segment 8 nonstructural protein 1 gene, complete cds.
gi|112456217|gb|DQ889685| /Human/8 (NS)/H1N1/USA/2005/// Influenza A virus (A/Iowa/CEID23/2005(H1N1)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|114215312|gb|DQ923514| /Swine/8 (NS)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ72-1/2006(H3N1)) nonstructural protein (NS) gene, complete cds
gi|114215314|gb|DQ923515| /Swine/8 (NS)/H3N1/South Korea/2006/// Influenza A virus (A/swine/Korea/CN22/2006(H3N1)) nonstructural protein (NS) gene, complete cds
gi|146454456|gb|EF551049| /Avian/8 (NS)/H3N2/USA/2004/// Influenza A virus (A/turkey/Illinois/2004(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds.
gi|146454474|gb|EF551057| /Swine/8 (NS)/H3N2/USA/2003/// Influenza A virus (A/swine/North Carolina/2003(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds.
gi|151175874|gb|EU015988| /Swine/8 (NS)/H1N2/China/2006/// Influenza A virus (A/swine/Guangxi/13/2006(H1N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds.
gi|187763988|gb|EU697208| /Avian/8 (NS)/H3N2/USA/2005/// Influenza A virus (A/turkey/Minnesota/366767/2005(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|189313128|gb|EU735822| /Avian/8 (NS)/H3N2/USA/2004/// Influenza A virus (A/turkey/OH/313053/2004(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|189313109|gb|EU735830| /Avian/8 (NS)/H3N2/USA/2005/// Influenza A virus (A/turkey/NC/353568/2005(H3N2)) nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|193877745|gb|EU743214| /Avian/8 (NS)/H3N2/USA/2005/// Influenza A virus (A/turkey/MN/366767/2005(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds.
gi|190403879|gb|EU798858| /Swine/8 (NS)/H1N1/South Korea/2004/// Influenza A virus (A/swine/Korea/CAN01/2004(H1N1)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403882|gb|EU798859| /Swine/8 (NS)/H1N1/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS08/2005(H1N1)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403885|gb|EU798860| /Swine/8 (NS)/H1N2/South Korea/2004/// Influenza A virus (A/swine/Korea/Hongsong2/2004(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403888|gb|EU798861| /Swine/8 (NS)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL01/2005(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes,

complete cds
gi|190403891|gb|EU798862| /Swine/8 (NS)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL02/2005(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403894|gb|EU798863| /Swine/8 (NS)/H1N2/South Korea/2005/// Influenza A virus (A/swine/Korea/JL04/2005(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403897|gb|EU798864| /Swine/8 (NS)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/Asan04/2006(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403900|gb|EU798865| /Swine/8 (NS)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ4/2006(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403903|gb|EU798866| /Swine/8 (NS)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ7/2006(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403906|gb|EU798867| /Swine/8 (NS)/H1N2/South Korea/2006/// Influenza A virus (A/swine/Korea/PZ14/2006(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403909|gb|EU798868| /Swine/8 (NS)/H1N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY08/2007(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403912|gb|EU798869| /Swine/8 (NS)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/CAS05/2004(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403915|gb|EU798870| /Swine/8 (NS)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAN04/2005(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403918|gb|EU798871| /Swine/8 (NS)/H3N2/South Korea/2005/// Influenza A virus (A/swine/Korea/CAS07/2005(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403921|gb|EU798872| /Swine/8 (NS)/H3N2/South Korea/2006/// Influenza A virus (A/swine/Korea/CAS09/2006(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403930|gb|EU798875| /Swine/8 (NS)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY07/2007(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|190403936|gb|EU798877| /Swine/8 (NS)/H3N2/South Korea/2007/// Influenza A virus (A/swine/Korea/CY10/2007(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|192382748|gb|EU826547| /Swine/8 (NS)/H3N2/Canada/2005/07/12/ Influenza A virus (A/swine/Quebec/4001/2005(H3N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds
gi|193245821|gb|EU850623| /Swine/8 (NS)/H1N2/China/2005/// Influenza A virus (A/swine/Guangxi/17/2005(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds.
gi|193245829|gb|EU850626| /Swine/8 (NS)/H1N2/China/2005/// Influenza A virus (A/swine/Hainan/1/2005(H1N2)) segment 8 nonstructural protein 2 (NS2) and nonstructural protein 1 (NS1) genes, complete cds.
gi|209486615|gb|FJ374516| /Swine/8 (NS)/H1N2/China/2007/03/24/ Influenza A virus (A/swine/Shanghai/1/2007(H1N2)) segment 8 nuclear export protein (NEP) and nonstructural protein 1 (NS1) genes, complete cds
gi|227977110|gb|FJ969514| /Human/8 (NS)/H1N1/USA/2009/04/01/ Influenza A virus (A/California/04/2009(H1N1)) segment 8 nuclear export protein (NEP) and nonstructural protein 1 (NS1) genes, complete cds

Swine, South Korea, 6 sequences

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gi|198387443|gb|EU301177| /Swine/1 (PB2)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) polymerase PB2 (PB2) gene, complete cds
gi|166080176|gb|EU301209| /Swine/4 (HA)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) hemagglutinin (HA) gene, complete cds.
gi|167996848|gb|EU301273| /Swine/6 (NA)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) segment 6 neuraminidase (NA) gene, complete cds
gi|198387445|gb|EU301304| /Swine/5 (NP)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) nucleoprotein (NP) gene, complete cds.
gi|198387447|gb|EU301368| /Swine/3 (PA)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) polymerase PA (PA) gene, complete cds.
gi|198387449|gb|EU301400| /Swine/2 (PB1)/H3N2/South Korea/2004/// Influenza A virus (A/swine/Korea/JNS06/2004(H3N2)) polymerase PB1 (PB1) gene, complete cds

Trichinellosis acquired in Senegal from warthog ham, March 2009

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Three confirmed and three suspected cases of trichinellosis have been reported in France with onset of symptoms in March 2009, linked to consumption of smoked warthog ham in Senegal.

Case detection and description

In early May 2009, the French National Reference Centre (NRC) for *Trichinella* was informed about three unrelated patients returning from Senegal who had high titres of specific anti-*Trichinella* antibodies (ELISA confirmed by western blot, LDBio Diagnostics, Lyon, France). Subsequently, the NRC identified a cluster of at least three confirmed cases according to the case definition criteria for trichinellosis defined in the guidelines of the Food and Agriculture Organization of the United Nations (FAO), World Health Organization (WHO) and World Organization for Animal Health (OIE) [1]. The patients were interviewed with a standard questionnaire available at the NRC web page [2]. It was established that the three patients, who lived in different regions of France, became infected after consumption of smoked warthog (*Phacochoerus africanus*) ham around mid-February 2009, in the same hotel in Saint–Louis (Ndar) in Senegal. The typical clinical symptoms (fever, facial and limbs oedema, myalgia) and biological signs (high eosinophilia ranging from 1 to 3.3 G/l, increased levels of muscular enzymes) appeared from early March to early April. No cardiac or neurological complications were observed. Only one patient was hospitalised, in France, for two weeks. All three patients were treated with albendazole (7.5 mg/kg twice a day for 15 days) and corticosteroids.

Outbreak investigation

Trichinellosis was suspected in three additional persons. Two of the suspected cases were the wife and the husband of two of the confirmed cases; they felt sick and tired but without typical signs. The third suspected case was a colleague of one confirmed case who presented suggestive signs (fever and diarrhoea) while still in Senegal where he lives. All three stayed in the same hotel and shared meals with the confirmed cases. Two of the suspected cases tested negative for anti-*Trichinella* antibodies but these tests were performed early after the suspected date of infection and no subsequent assays were performed. The three suspected cases were also treated with albendazole as they shared meals with the confirmed cases.

The hotel, in which the three confirmed and the three suspected cases stayed and were infected, hosts guests from different European countries. According to the hotel director, no other cases of trichinellosis were reported amongst the guests or staff and their families although they had also consumed warthog ham. He stated that the warthog meat is usually deep-frozen for several weeks before being processed as ham. The incriminated warthog ham was not available for parasitological examination. So far, no similar cases related to these index cases have been reported, although French and European networks of parasitologists were alerted by email. The Senegalese veterinary services were also informed about this outbreak.

Discussion

Human trichinellosis was first reported in Senegal in the 1960s, when an outbreak involving nine French expatriates occurred after consumption of warthog meat coming from the Senegal delta region (Boundoum) [3]. Subsequent veterinary studies reported a 4% prevalence of *Trichinella* infection in 450 Senegalese warthogs [4]. Pozio *et al.* [5] identified isolates from carnivore mammals of neighbouring Guinea as belonging to the species *Trichinella britovi* but could not find *Trichinella* in any of the 10 warthogs examined. *T. britovi* could also be present in Senegal and experiments have shown that this species of *Trichinella* is partially resistant to freezing [6]. Moreover, there is a lack of reliability and precision of the temperature in non industrial freezers. Outbreaks of human trichinellosis related to *Suidae* meat are not very frequent in Africa, although small outbreaks related to wild boar (*Sus scrofa*) have been described in French expatriates living in Algeria [7], to warthog (*Phacochoerus sp.*) in Ethiopia and Tanzania and to bush pigs (*Potamochoerus sp.*) in Kenya [8]. The French NRC also documented sporadic cases from Kenya (two infected persons) in 1995 and from Cameroon in 1999 (one infected person) [9]. In Africa, meat is usually consumed well done and pork is not consumed by the Muslims, which explains the fact that trichinellosis has been documented mostly in Europeans. Travel in endemic regions is a classical driver for acquiring trichinellosis and travellers should be informed of the risks of eating raw or rare meat products, and particularly game meat such as warthog in Africa [10].

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References

1. Dupouy-Camet J, Murrell KD, editors. FAO/WHO/OIE Guidelines for the surveillance, management, prevention and control of trichinellosis. Food and Agriculture Organization of the United Nations (FAO), World Health Organization (WHO), World Organisation for Animal Health (OIE): Paris; 2007. Available from: ftp://ftp.fao.org/docrep/fao/011/a0227e/a0227e.pdf
2. Centre National de Référence des Trichinella [National Reference Centre for Trichinella]. Déclaration de cas [Case notification form]. 23 March 2009. Available from: http://monsite.wanadoo.fr/cnrdestrichinella/page5.html
3. Onde M, Carayon A. [Dakar cases of trichinosis]. Bull Soc Med Afr Noire Lang Fr. 1968;13(2):332-6. [in French]
4. Grétillat S, Chevalier JL. [Preliminary note on the epidemiology of trichinosis in wild animals in Western Africa]. Bull World Health Organ. 1970;43:749-57. [in French]. Available from: http://whqlibdoc.who.int/bulletin/1970/Vol43/Vol43-No5/bulletin_1970_43(5)_743-766.pdf
5. Pozio E, Pagani P, Marucci G, Zarlenga DS, Hoberg EP, De Meneghi D, et al.Trichinella britovi etiological agent of sylvatic trichinellosis in the Republic of Guinea (West Africa) and a re-evaluation of geographical distribution for encapsulated species in Africa. Int J Parasitol. 2005;35(9):955-60.
6. Pozio E, Kapel CM, Gajadhar AA, Boireau P, Dupouy-Camet J, Gamble HR. Trichinella in pork: current knowledge on the suitability of freezing as a public health measure. Euro Surveill. 2006;11(46):pii=3079. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=3079
7. Nezri M, Ruer J, De Bruyne A, Cohen-Valensi R, Pozio E, Dupouy-Camet J. [First report of a human case of trichinellosis due to Trichinella britovi after jackal (Canis aureus) meat consumption in Algeria]. Bull Soc Pathol Exot. 2006;99(2):94-5. [in French]. Available from: http://www.pathexo.fr/documents/articles-bull/2006/2006n2/T99-2-2809-2p.pdf
8. Pozio E. Taxonomy, biology and epidemiology of Trichinella parasites. In: Dupouy-Camet J, Murrell D. Editors. FAO/WHO/OIE Guidelines for the Surveillance, Management, Prevention and Control of Trichinellosis. Food and Agriculture Organization of the United Nations (FAO), World Health Organization (WHO), World Organisation for Animal Health (OIE): Paris; 2007. Available from: ftp://ftp.fao.org/docrep/fao/011/a0227e/a0227e.pdf
9. Ancelle T, De Bruyne A, Niang M, Poisson DM2, Prazuck T, Fur A, Weinbreck P, et al. Épidémie de trichinellose à Trichinella nativa due à la consommation de viande d'ours, France 2005 [Outbreak of trichinellosis caused by Trichinella nativa due to consumption of bear meat]. BEH. 2006;14:96-98. [in French]. Available from: http://www.invs.sante.fr/beh/2006/14/beh_14_2006.pdf
10. Dupouy-Camet J. Trichinellosis: still a concern for Europe. Euro Surveill. 2006;11(1):pii=590. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=590

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Preparedness for the prevention and control of influenza outbreaks on passenger ships in the EU: the SHIPSAN TRAINET project communication

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Passenger ships carry a large number of people in confined spaces. A case of the new influenza A (H1N1) virus aboard a passenger ship is an expected event and would lead to rapid spread of the virus, if preventive measures are not in place. However, many cruise lines have detailed policies and procedures to deal with cases of influenza like illness (ILI). The EU SHIPSAN and SHIPSAN TRAINET projects include in their objectives guidelines for the prevention and control of communicable diseases aboard passenger ships. A literature review showed that from 1997 to 2005, nine confirmed outbreaks of influenza were linked to passenger ships, with attack rates up to 37%. It is important to establish and maintain a surveillance system for ILI aboard passenger ships, in order to systematically collect data that can help to determine the baseline illness levels. Monitoring these will enable early identification of outbreaks and allow timely implementation of control measures.

Introduction

Travel has played a major role in the transmission of the new influenza A (H1N1) virus throughout the world. Since April 2009, when the virus was recognised in Mexico, up to 25 May 2009, a total of 46 countries have officially reported 12,515 cases of new influenza A (H1N1) infection [1]. Within Europe, a total of 360 confirmed cases have been reported by 19 European Union (EU) and European Free Trade Association (EFTA) countries [2]. About 84% of the patients (149 out of 178 – data up to 6 May 2009) for whom travel history was available, reported recent travel to Mexico or USA and among the non travellers 52% reported contact with a returning traveller from Mexico [3]. To our knowledge, up to now all transmission to new countries has been through travel by air or by land.

Means of transport where large numbers of people gather, including airplanes and passenger ships, can provide the place for the spread of disease from person to person or indirect transmission (e. g. contaminated surfaces). Within the EU, a large number of people travel by passenger ships, including ferries and cruise ships, for transport or leisure purposes. There were about 410 million passenger visits through EU ports in 2007 [4]. Even though to date there have been no confirmed cases of the new influenza A (H1N1) virus among passenger ship travellers, guidelines and protocols for the prevention of a potential introduction and control of the spread of influenza on board passenger ships have been prepared or are currently under preparation by governmental agencies [5], the passenger ship industry [6] as well as the International Maritime Health Association (IMHA) [7].

During a cruise or ferry voyage, passengers and crew members spend much of their time indoors. Passengers and crew may be from several nations and can intermingle for extended periods of time in semi enclosed areas. Shipboard activities and events such as dining, games, and movies increase the likelihood of contact between passengers and sometimes with crew as well [8]. The virus is easily spread from person to person by inhalation of the air that contains droplets from infected people who cough or sneeze, or by transferring the virus directly by hand or from surfaces contaminated by droplets to mucus membranes of the eyes, nose and mouth.

This paper describes the EU SHIPSAN TRAINET project activities that are related to the prevention and control of influenza outbreaks on board passenger ships.

SHIPSAN project

In 2006, the European Union project SHIPSAN (www.shipsan.eu) was established and funded by the Directorate General for Health and Consumers of the European Commission in order to assess the usefulness for an integrated common programme for communicable diseases surveillance and hygiene inspections in Europe. In the frame of this project, public health risks that may occur on passenger ships were assessed and a review of the relevant legislation and literature on communicable diseases outbreaks,

including respiratory infections, was conducted. Based on this information, proposals were prepared for the prevention and control of communicable diseases on passenger ships. The literature review showed among other things, that high attack rates of influenza have been reported in closed settings such as cruise ships [9]. From 1997 to 2005, nine confirmed outbreaks of influenza, linked to passenger ships, have been described in the scientific literature [8,10-13], including two in Europe (Mediterranean countries, United Kingdom and Germany). The infectious agent in seven out of the nine outbreaks was influenza A virus, in one it was influenza B and in one it was influenza A and B virus. A total of 898 cases have been reported including passengers and crew members. The attack rate ranged between 0.5 to 37%. However, it should be noted that many of the passengers are more than 65 years old, belonging to a high risk group for complications. The reported outbreaks highlight the need to develop criteria for determining when an outbreak is occurring and for effective surveillance protocols so that early and targeted prevention efforts may be instituted [14]. The SHIPSAN partnership proposals (as described in the final report of the project) on what needs to be done in the EU included: standardised syndromic surveillance for influenza like illness (ILI) on board passenger ships, outbreak management guidelines for port health authorities and crew members, web-based communication between ports and hygiene standards and protocols.

EU SHIPSAN TRAINET project

The proposals formulated as a result of the SHIPSAN project are now being implemented within the EU SHIPSAN TRAINET project which started in 2008 and will be completed in May 2011. This project foresees the development of: a) harmonised communicable diseases surveillance including ILI syndrome by using standardised reporting forms, b) a manual providing hygiene standards (e.g. for disinfection and cleaning), and outbreak management guidelines for airborne diseases, c) training of port health personnel and crew members on hygiene issues and outbreak management and d) a communication network for collection and sharing of surveillance and ship inspection data among competent authorities. The systematic collection by passenger ships of routine syndromic surveillance data for gastrointestinal diseases and ILI, based on standard definitions, will help to determine threshold levels and identify outbreaks. An expert working group consisting of 75 participants from EU Member States, international organisations (WHO) and communicable diseases surveillance networks has been established in order to develop the manual, the reporting forms and the network operating specifications. The manual will be delivered in May 2010.

Passenger ship industry preparedness

Cruise ships provide a safer environment for travellers compared to other vacation settings. Doctors, nurses and very well equipped infirmaries are always available to passengers and crew on board ships. Active systematic surveillance is conducted for early identification of outbreaks. Cruise lines have detailed policies and procedures to deal with cases of ILI and for example many cruise ships are already equipped with diagnostic test kits for the influenza virus on board (although with limited reliability). Personal protective equipment (gloves and masks), disinfectants and detailed cleaning and disinfection protocols are already in place. The Cruise Lines International Association has issued a Public Health Questionnaire which should be completed by all persons before boarding the ship, as well as a preparedness protocol [6]. The goals of the protocol are to early identify, isolate and treat suspected cases, thus minimising risk of transmission.

European Union early warning and response system (EWRS)

In the European Union, there exist a network for the epidemiological surveillance and control of communicable diseases administered by the European Centre for Disease Prevention and Control [15] and an early warning and response system (EWRS) [16] which enables to collect and exchange all necessary information on communicable disease events among competent public health authorities in the Member States, in liaison with the European Commission. The specific case definition for reporting of the new influenza A (H1N1) virus was adopted on 30 April 2009 [17] to enable the national competent authorities to communicate relevant information to the Community network. Consequently, at national level the port health authorities should follow the existing national surveillance system pathways and notify the competent health authority of any suspected case fulfilling the influenza case definition, which occurs on board of a ship.

European Union Port Health Authorities preparedness - International Health Regulations (2005) requirements

The International Health Regulations (2005), entered into force on 15 June 2007, in the Article 23(1) it provides that the State Parties to the World Health Organization (WHO) may require for public health purposes, on arrival or departure, certain data regarding travellers [18].

Furthermore, ships are required to submit a Maritime Declaration of Health to the competent port health authority of the next port of call according to the International Health Regulations (Article 37). This document communicates information about persons on board that are suspected of being infected by a communicable disease, including influenza. According to the International Health Regulations (IHR, Annex I), competent authorities at ports are responsible for providing, if necessary, medical examination and care for affected travellers. In addition, appropriate space, separate from other travellers, must be designated to interview suspected or affected persons. Competent authorities may also assess and, if required, quarantine suspected travellers. Trained personnel with appropriate personal protection, for the transfer of travellers who may carry infection or contamination, should be available. However, it should be noted that these capacities should be met by all countries by 2012 according to the IHR timeframes for implementation.

EU Member States are preparing national guidelines for surveillance and management of new influenza cases for both port authorities and ships. We are aware of specific guidelines which are prepared by at least five countries: France, Germany (www.rki.de), Estonia, the United Kingdom and Holland [personal communication].

It is interesting to note that historical data from the 1918 and 1957 pandemics show that quarantine measures introduced at ports in some countries delayed the onset of an influenza pandemic up to three months [19]. Intervention as barrier measures against influenza pandemic spread are easier to implement at national and community levels than travel ban at international level. Screening of travellers departing countries has been recommended in an article published by a WHO working group in the past [19]. Current WHO guidelines recommend that exit screening for all travellers

from affected areas is more feasible than entry screening for early detection of cases [20].

Summary of guidelines

The SHIPSAN TRAINET partnership has considered the following actions as options to be implemented, in order to prevent the spread of influenza infections on board cruise ships and ferries:

Pre-embarkation

- A routine annual vaccination programme for all crew members should be considered [14].
- Before boarding a ship, all persons (passengers, crew members, visitors) should be required to complete and sign a written health questionnaire which is designed to screen for the symptoms of influenza.
- Passengers who have symptoms of influenza should not be allowed to board the ship, and should be referred for medical evaluation to one of the national health services to ensure diagnosis and adequate treatment.
- Crew members who have symptoms of influenza should undertake a medical evaluation and be confined to their cabin quarters for the duration of the illness [5].
- Leaflets should be disseminated to passengers and crew members including information about symptoms and hygiene rules (hand washing, coughing and sneezing etiquette, disposal of dirty tissues, etc.) and what to do in case of compatible symptoms.

During the voyage

- Adequate supplies of anti-viral drugs, gloves, masks and disinfectants effective against influenza virus should be available on board.
- Rapid influenza diagnostic tests should be available. However, results of these tests should be interpreted with caution and false positive and false negative results should be taken into consideration.
- Treatment should be provided to cases and chemoprophylaxis contacts in accordance with WHO [21] and ECDC [22] recommendations.
- Standardised surveillance data using a standardised definition for ILI should be collected in the ship medical log. Data that are collected should include, at a minimum: patient age, sex, onset date of symptoms, respiratory symptoms (fever and either cough or sore throat, malaise, myalgia, chest pain), signs of complications (like difficulty of breathing, purple or blue discoloration of the lips, vomiting) or signs of dehydration, pregnancy, chronic medical conditions (such as asthma, diabetes or heart disease), recovery or death, country of residence and/or destination, and results of diagnostic testing (e.g., rapid viral and bacterial tests, chest x-ray). Data should be routinely reviewed to assess trends in disease frequency [14].
- Active surveillance among passengers and crew members should be initiated by the ship's medical staff to detect new cases of respiratory illness once an influenza outbreak has been identified. Active surveillance should include directly contacting passengers (e.g. passenger surveys) and crew members and should be recorded [14].
- Ill crew members and passengers should be isolated in cabins and a limited number of persons should come into contact with them. Surgical masks should be worn by patients.
- Healthcare workers and crew members that come into contact with patients should be trained in proper use of gloves and certified particulate disposable respirators (EN 149:2001) [5].
- Crew members should be trained in order to follow protocols for cleaning materials contaminated by body fluids and to properly manage waste [5].

Before disembarkation

- For ships on international voyages, the Maritime Declaration of Health according to IHR should be completed and sent to the competent authority, if an infection has occurred on board and according to national legislation of the country of disembarkation. Ships may be required to report the previous itinerary for a given period before entering a port.
- The competent port health authorities should be informed if any support is needed (clinical specimen examination, disinfection, hospitalisations) before the ship arrives at port.

After disembarkation

- Preventive measures should be taken to avoid the recurrence of an outbreak in the next voyage.
- Early suspicion of potential cases of influenza among passengers and crew members and rapid implementation of a respiratory illness control protocols can probably limit the size of outbreaks.

Conclusions

Currently, just one case of new influenza A (H1N1) virus infection on a ship, even though it is an expected event, may trigger the implementation of emergency plans by the passenger ship industry as well as competent authorities or result in an overreaction to the event. However, we believe that it is important to establish and maintain a surveillance system for ILI on board passenger ships, in order to systematically collect data that can help to determine the baseline illness levels. Monitoring these will enable early identification of outbreaks and allow timely implementation of control measures.

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References

1. World Health Organization. Influenza A(H1N1) - update 38. 25 May 2009. Available from: http://www.who.int/csr/don/2009_05_25/en/index.html
2. European Centre for Disease Prevention and Control. ECDC Situation Report. Influenza A(H1N1) infection. 25 May 2009. Available from: http://www.ecdc.europa.eu/en/files/pdf/Health_topics/Situation_Report_090525_1700hrs.pdf
3. Update: Novel Influenza A (H1N1) Virus Infections - Worldwide, May 6, 2009. MMWR Morb Mortal Wkly Rep 2009 May 8;58(17):453-8.
4. Amerini G. Maritime transport of goods and passengers 1997-2007. Eurostat Statistics in focus 2009;6.
5. Centers for Disease Control and Prevention. Interim novel influenza A (H1N1) guidance for cruise ships. 4 May 2009. Available from: http://www.cdc.gov/h1n1flu/guidance/cruiseships.htm
6. Cruise Lines International Association. Influenza H1N1 screening. [Accessed on 25 May 2009]. Available from: http://www.cruising.org/Press/InfluenzaH1N1Screening.cfm
7. International Maritime Health Association. Interim Guidance Regarding Influenza A(H1N1) for the Maritime Community. [Accessed on 25 May 2009]. Available from: http://imha.net/images/stories/IMHA%20InfluenzaA%20H1N1%20Interim%20Advice.pdf

8. Miller JM, Tam TW, Maloney S, Fukuda K, Cox N, Hockin J, et al. Cruise ships: high-risk passengers and the global spread of new influenza viruses. Clin Infect Dis 2000 Aug;31(2):433-8.

9. Minooee A, Rickman LS. Infectious diseases on cruise ships. Clin Infect Dis 1999 Oct;29(4):737-43.

10. Update: influenza activity -- United States, 1997-98 season. MMWR Morb Mortal Wkly Rep 1997 Nov 21;46(46):1094-8.

11. Influenza on a cruise ship in the Mediterranean. Commun Dis Rep CDR Wkly 1999 Jun 11;9(24):209, 212.

12. Influenza B virus outbreak on a cruise ship--Northern Europe, 2000. MMWR Morb Mortal Wkly Rep 2001 Mar 2;50(8):137-40.

13. Brotherton JM, Delpech VC, Gilbert GL, Hatzi S, Paraskevopoulos PD, McAnulty JM. A large outbreak of influenza A and B on a cruise ship causing widespread morbidity. Epidemiol Infect 2003 Apr;130(2):263-71.

14. Centers for Disease Control and Prevention. Preliminary Guidelines for the Prevention and Control of Influenza-Like Illness Among Passengers and Crew Members on Cruise Ships. 1999.

15. Decision No 2119/98/EC of the European Parliament and of the Council of 24 September 1998 setting up a network for the epidemiological surveillance and control of communicable diseases in the Community. Official Journal L 268, 03/10/1998 P. 0001 - 0007. Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31998D2119:EN:HTML

16. Commission Decision of 22 December 1999 on the early warning and response system for the prevention and control of communicable diseases under Decision No 2119/98/EC of the European Parliament and of the Council. (2000/57/EC). Official Journal L 21/32-35. 26.01.2000. Available from: http://eur-lex.europa.eu/pri/en/oj/dat/2000/l_021/l_02120000126en00320035.pdf

17. Commission decision of 30 April 2009 amending Decision 2002/253/EC laying down case definitions for reporting communicable diseases to the Community network under Decision n° 21/19/98/EC. 2009/363/EC. Official Journal L 110/58. 01.05.2009. Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:110:0058:0059:EN:PDF

18. World Health Organization. International Health Regulations. 2005. Available from: http://www.who.int/ihr/en/

19. Bell DM. Non-pharmaceutical interventions for pandemic influenza, international measures. Emerg Infect Dis 2006 Jan;12(1):81-7

20. World Health Organization. Pandemic influenza preparedness and response. WHO guidance document. April 2009. Available from: http://www.who.int/csr/disease/influenza/pipguidance2009/en/index.html

21. World Health Organization. Clinical management of human infection with new influenza A (H1N1) virus: Initial guidance. 21 May 2009. Available from: http://www.who.int/csr/resources/publications/swineflu/clinical_management/en/index.html

22. European Centre for Disease Prevention and Control. Interim ECDC public health guidance on case and contact management for the new influenza A (H1N1) virus infection. 19 May 2009. Available from: http://www.ecdc.europa.eu/en/Health_topics/novel_influenza_virus/2009_Outbreak/

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KPC-2-producing *Klebsiella pneumoniae* infections in Greek hospitals are mainly due to a hyperepidemic clone

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To verify the presence of *Klebsiella pneumoniae* carbapenemase-producing (KPC–producing) *Klebsiella pneumoniae* in Greece, we asked 40 Greek hospitals participating in the Greek System for the Surveillance of Antimicrobial Resistance (GSSAR) to apply a combination of the modified Hodge test plus EDTA synergy test on all *K. pneumoniae* clinical isolates obtained from February 2008 which displayed reduced susceptibility to carbapenems (MIC of imipenem ≥ 1 mg/L). The presence of the *bla*KPC gene was confirmed by PCR and sequencing. This procedure revealed the presence of KPC-2 in isolates from 173 patients in 18 hospitals during a period of 11 months. Of these, 166 isolates belonged to a single pulsotype a fact consistent with possible epidemic spread, whereas the remaining seven isolates were further classified into four different pulsotypes. *bla*KPC-2 gene was found to be transferable by conjugation in the four pulsotypes other than the prevailing one. The emergence of a new carbapenemase gene in Greece, where high resistance rates to carbapenems in *K. pneumoniae* due to the spread of the VIM type metalloenzyme have been observed, emphasises the urgent need for the implementation of public health measures in the field of infection control and antibiotic consumption. It also underlines the need to supplement surveillance systems based on susceptibility data with the surveillance of resistance mechanisms.

Introduction

Resistance to carbepenems is one of the major threats for treatment of infections caused by Gram-negative bacteria, and the production of carbapenemases is the most important molecular mechanism both clinically and epidemiologically. Carbapenemases are beta-lactamases and are divided into two major molecular groups, differentiated by the hydrolytic mechanism in the active site. The first group contains at least one zinc atom at the active site, establishing them as metalloenzymes, represented mainly by Verona integron-encoded metallo-beta-lactamase (VIM) and IMP-type carbapenemases. The second group utilises serine at the active site and its main representatives are *Klebsiella pneumoniae* carbapenemase (KPC) type enzymes belonging to the Bush group 2f [1].

Two publications, one in late 2007 and the other in early 2008, reported infections due to KPC-producing *K. pneumoniae* in two patients, one in Sweden and the other in France. Both patients had originally been hospitalised in Crete, Greece [2,3].

Following these reports, in February 2008, the Department for interventions in healthcare facilities at the Hellenic Center for Disease Control and Prevention (HCDCP) in collaboration with the Greek System for the Surveillance of Antimicrobial Resistance (GSSAR) initiated a study aimed at confirming the presence of such clinical strains in Greece, and assessing the extent of their spread in the Greek hospitals. The objective was also to investigate the genetic relatedness of the respective bacterial strains and the transferability of the *bla*KPC-harbouring plasmids.

In this paper we report the preliminary results of this study. Part of these results have been presented at the 19th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID) in Helsinki in May 2009.

Materials and methods

Study design

Written guidelines on how to detect isolates producing KPC were distributed to microbiology laboratories of the 40 hospitals that participate in the GSSAR*. These hospitals can be considered representative of all Greek hospitals, geographically, by type and by size. The laboratories were asked to screen all *K. pneumoniae* isolates displaying reduced susceptibility to carbapenems (minimum inhibitory concentration [MIC] of imipenem ≥ 1 mg/L), and, subsequently, send those identified as possible KPC-producing isolates to the microbiology laboratory at the National School of Public Health (NSPH) for confirmation and further analysis.

Susceptibility testing

Susceptibility tests were performed by the agar dilution method according to the guidelines of the Clinical and Laboratory Standards Institute (CLSI) [4]. MIC of imipenem was determined by Etest according to the instructions of the manufacturer (AB Biodisk, Solna, Sweden).

Phenotypic detection of the KPC enzyme

Preliminary phenotypic detection of the KPC enzyme performed by the hospital laboratories was based on the combination of a bioassay test - the Hodge (cloverleaf) test - and the EDTA synergy test [5].

A possible case of KPC-producing *K. pneumoniae* was defined as an isolate which displayed reduced susceptibility to carbapenems (MIC of imipenem ≥1mg/L) and tested positive in modified Hodge test for the presence of carbapenemase activity, and negative in EDTA synergy test for the presence of metalloenzymes.

A possible case of VIM-producing *K. pneumoniae* was defined as an isolate which displayed reduced susceptibility to carbapenems (MIC of imipenem ≥1mg/L) and tested positive in Hodge (cloverleaf) test for the presence of carbapenemase activity and positive in EDTA synergy test for the presence of metalloenzymes.

Both tests were negative in strains not producing carbapenemase.

Hodge (cloverleaf) test (bioassay)

The indicator organism, Escherichia coli ATCC 25922, at a turbidity of 0.5 McFarland standard, was used to inoculate the surface of a Mueller Hinton agar plate, and the test strain was heavily streaked from the centre to the plate periphery. After the plate was allowed to stand for 15 minutes at room temperature, a 10µg IPM disk was placed at the centre of the streak, and the plate was incubated overnight. The presence of an even slightly distorted inhibition zone was interpreted as a positive result for carbapenem hydrolysis

EDTA synergy test

The test strain, at a turbidity of 0.5McFarland standard, was used to inoculate the surface of a Mueller Hinton agar plate. Disks of imipenem (10 µg), meropenem (10 µg), ceftazidime (30 µg) and piperacillin (100 µg) were placed at a 20mm centre-to-centre distance from a disk containing 930µg EDTA. The plate was incubated overnight. The presence of distorted inhibition zones to either antibiotic disk was interpreted as a positive result for metallo-beta-lactamase production

Confirmation of the presence of the blaKPC gene

The presence of the *bla*KPC gene was confirmed by PCR using forward and reverse primers proposed by Queenan and Bush [1], and subsequent sequencing on both strands of the PCR products.

Molecular typing was performed by pulsed field gel electrophoresis (PFGE) of XbaI-restricted genomic DNA as described previously [6]. Restriction fragments were separated through a 1% agarose using a contour-clamber homogeneous electric field DRIII apparatus (BioRad, Milano, Italy). Gel Compar II was used for classification of the isolates into PFGE types.

Strains

*bla*VIM and extended-spectrum beta-lactamase (ESBL)-producing *K. pneumoniae* isolates used in this study for the quality assessment of the phenotypic tests came from the collection of the microbiology laboratory at NSPH.

Conjugation

Conjugal transfer of antibiotic resistance was performed in mixed broth cultures as described previously [7] using the *Escherichia coli* strain 1R716 (StrR, lac-) as a recipient. Transconjugant clones were selected in McConkey agar containing streptomycin 1000µg/ml plus ampicillin 100µg/ml.

Results

From February 2008 until December 2008, 21 hospitals sent us a total of 225 *K. pneumoniae* isolates, from an equal number of patients, phenotypically considered as possible KPC-producers. Hospitals sent different numbers of isolates (ranging from one to 37). Further analysis by PCR and sequencing at the NSPH laboratory confirmed 173 (77%) isolates from 18 hospitals to harbour *bla*KPC-2 gene. The remaining 52 isolates were found to be VIM-producers.

Interestingly, when the two phenotypic tests were repeated at the NSPH, the results indicated possible KPC production in 171 of the 173 PCR-confirmed KPC-2-producing isolates and in none of the 52 VIM-producing isolates. Two isolates that showed a positive bioassay test and a positive EDTA synergy test due to VIM-1 production, exhibited resistance to aztreonam and were found to concurrently produce KPC-2 enzyme.

The validity of the proposed combination of the phenotypic tests for the detection of the various carbapenemases was further evaluated using 34 VIM-producing and 41 ESBL-producing *K. pneumoniae* available in the microbiology laboratory at NSPH. The tests were able to identify all but three VIM-producing isolates which displayed a falsely negative bioassay and a positive EDTA test. The results were negative for all ESBL-producing isolates.

To estimate the probable period of emergence of the KPC-2-producing *K. pneumoniae* in Greece, all carbapenem-non-susceptible isolates in the collection of the microbiology laboratory at NSPH (which serves as the reference centre for carbapenem-resistant Enterobacteriaceae) were screened and found negative for the presence of *bla*KPC-2 gene. This collection of samples covered a period of seven years (January 2001 – December 2007).

Geographical distribution

The 171 confirmed KPC-2-producing *K. pneumoniae* isolates were obtained from three hospitals in Crete, 14 hospitals in the Athens – Piraeus area, and one hospital in Thessaloniki.

PFGE patterns of the X*ba*I restriction fragments of KPC-2-producing *K. pneumoniae* isolates are shown in the Figure. Isolates producing KPC-2 were classified into five pulsotypes displaying 90% similarity within each type. Pulsotype A included 166 isolates, pulsotype B consisted of one isolate, and pulsotypes C, D and E included two isolates each. The two isolates producing both VIM-1 and KPC-2 belonged to pulsotype C (Table).

Pulsotype A was found in all but one hospital a fact consistent with possible epidemic spread, whereas pulsotypes B and C were found exclusively in Crete, each in different hospitals, together with pulsotype A. Pulsotype E was found in one hospital in Crete and in one hospital in Athens, whereas pulsotype D was found only in one hospital in Athens.

Pulsotype A was also found to be indistinguishable from the clinical strains isolated from patients in Sweden and France initially hospitalised in Greece [2,3], as well as from a patient transferred

to France from Israel and already known in Israel to be infected by this strain [V. Jarlier, personal communication].

Sensitivity testing

Sensitivity testing revealed that all KPC-2-producing isolates were resistant to the combinations of penicillin with beta-lactamase inhibitors, as well as to ceftazidime and aztreonam and non-susceptible to cefoxitin, cefotaxime and cefepime. Colonies observed within the ellipses of inhibition made determination of the imipenem MIC difficult (see also reference 8). Concerning other drug classes, isolates of A, C and D types were resistant to aminoglucosides (except gentamycin), cotrimoxazole and quinolones and only tetracycline and tigecycline were shown efficacious in all types (Table). Type B strain was sensitive to all other drug classes tested.

Conjugation

Conjugal transfer was attempted with two isolates per hospital for pulsotype A and with all isolates belonging to the other pulsotypes. Transconjugants at a rate of 10-6 were recovered from isolates of pulsotype B, C, D and E but not from the prevailing pulsotype A. Presence of *bla*KPC-2 gene in all transconjugants was confirmed by PCR (only the *bla*KPC-2 gene and not the *bla*VIM gene from the pulsotype C isolate was transferred). Transconjugants were resistant to combinations of penicillin with beta-lactamase inhibitors and aztreonam, but were susceptible to all other oxyimino-beta-lactams. MIC values of imipenem were two to five doubling dilutions higher than that of the recipient (recipient's MIC of imipenem was 0.25 mg/L), but remained within the fully susceptible area as determined by the CLSI criteria [6]. Transconjugants from pulsotypes B, C and E were susceptible to all other drug classes, whereas in transconjugant from pulsotype D resistance to all other drug classes except quinolones was transferred. Work is in progress for the further characterisation of the genetic environment of the *bla*KPC-2 gene.

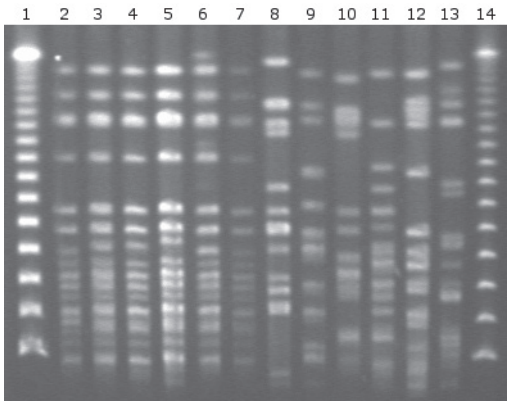
Discussion

The occurrence of KPC-producing *K. pneumoniae* seems to be an emerging public health problem in various parts of the world [9,10], although, to date, widespread hospital outbreaks have been reported mainly in the United States [11,12] and Israel [13,14]. Greece seems to be the third country facing a similar widespread problem. International cooperation through the early publication of reports [2,3] proved very helpful for the timely mobilisation of the Public Health System in Greece and the early detection of this epidemic.

A combination of the modified Hodge (cloverleaf) test with the EDTA synergy test was used by the hospital laboratories in Greece for the preliminary detection of the KPC-producing *K. pneumoniae.* Similar approaches have been described for the phenotypic detection of the carbapenemase-producing *Enterobacteriaceae* [15,16,17,18]. However various authors suggest the use of boronic acid disk potentiation tests for the detection of the KPC enzymes [19,20,21]. Although in the reference laboratory this approach showed high sensitivity and specificity for both detection of carbapenemases and discrimination of the KPC and VIM enzymes, the high number of errors in identifying the type of carbapenemase among the test results obtained initially by the hospital laboratories,

Figure

PFGE analysis of XbaI-digested genomic DNA from representative KPC-2-producing *Klebsiella pneumoniae* described in this study



Legend:
lanes 1 and 14: Lambda Ladder PFG Marker (New England Biolabs, Ipswich, MA);
lanes 2-7: pulsotype A;
lane 8: pulsotype B;
lane 9: pulsotype C;
lane 10: pulsotype D;
lane 11: pulsotype E;
lanes 12 and 13: VIM-producing *K. pneumoniae*

Table

Summary of epidemiological data and information on antibiotic susceptibility and transferability of the KPC-2-producing *Klebsiella pneumoniae* isolates described in this study

Pulsotype	Number of isolates	Number of hospitals	Resistance to other drug classes*	blaKPC gene transferred via conjugation	Other drug classes transferred
A	166	18	an, net, tb, spt, sxt, c, cip	No	
B	1	1	–	Yes	
C	2	1	an, net, tb, spt, sxt, cip	Yes	–
D	2	1	gm, an, net, tb, spt, sxt, c, cip	Yes	gm an net tb spt sxt c
E	2	2	net, tb, spt, sxt, c, cip	Yes	–

*Abbreviations:
an - amikacin, net - metilmicin, tb - tobramycin, spt - spectinomycine, sxt - cotrimoxazole, c - chloramphenicole, cip - ciprofloxacin, gm - gentamicin.
– : negative result

underline the importance of experience needed in performing and interpreting such tests.

Furthermore it is well recognised that these enzymes confer low level resistance, lower than the established breakpoints [8]. Since this study was confined to strains exhibiting a MIC value of imipenem not less than 1 mg/L, the possible presence of undetected strains exhibiting lower MICs can not be excluded and thus it is possible that the overall prevalence has been underestimated.

These represented the major limitations of our study which made it difficult to assess the exact prevalence of the KPC-producing isolates in Greece as well as the exact date of the first isolation in each hospital.

With these limitations in mind, however, it can be deduced, mainly from the two published reports on Swedish and French patients hospitalised in Crete [2,3], from the results of an epidemiological study subsequently performed in Crete [22] and from the fact that no KPC-producing *K. pneumoniae* were found in the collection of the reference laboratory, that the first KPC-2-producing isolates seem to have emerged in Crete in spring 2007 [2,22]. The rapid mainly monoclonal epidemic spread in the rest of the country could at least partly be explained by the movement of patients among hospitals, a well known practice in Greece.

Currently, the KPC-2 enzyme seems to spread in Greece in *K. pneumoniae* and other *Enterobacteriaceae* in parallel with the well established VIM-type [23]. Data from the Greek System for the Surveillance of Antimicrobial Resistance (www.mednet.gr/whonet) show that there has been an increase in the resistance rates to imipenem in K. pneumoniae during the last three years [23].

Consumption of antibiotics in hospitals in Greece, overall and of the newer beta-lactam antibiotics (third generation cephalosporins and carbapenems), is reported to be the highest in Europe [24]. Carbapenems and third generation cephalosporins can act as selective factors for both *bla*VIM and *bla*KPC genes. Interestingly, VIM- producing *K. pneumoniae* were shown to cause a polyclonal epidemic in Greece [5,23], while KPC-2-producing *K. pneumoniae* isolates were found to belong to a single PFGE genotype in the vast majority of cases. Genetic homogeneity is probably consistent with the recent introduction and clonal spread of KPC-2-producing isolates. It also implies that infection control is an important public health strategy for the containment of the KPC-producing mechanism.

The spread of KPC-2 via indistinguishable pulsotypes, as described in this study, was also shown in outbreaks in New York [25]. However, the location of *bla*KPC-2 gene on transferable plasmids as in the case of pulsotypes B to E observed in this study, could contribute to its further spread among clones and bacterial species. Transferable plasmids indistinguishable by restriction profile analysis were implicated in the dissemination of KPC-2 in various instances [26]. Moreover, the ability of *bla*KPC-2 gene to coexist with *bla*VIM gene observed in this study, as well as with other newer beta-lactam-resistant determinants recently described [9] can lead to difficult to treat bacterial infections.

The observed similarity between the Greek major clone and the isolate from Israel could be regarded as consistent with the possible spread of the Israeli clone in Greece, a hypothesis that must be further evaluated. It is important to note however that in Israel, the *bla*KPC-2 gene was found on six different pulsotypes of *K. pneumoniae* [13] whereas the *bla*KPC-3 gene was found to spread monoclonally [13]. Recently, the possible spread of strains carrying the *bla*KPC-3 gene from Israel to the United Kingdom has been reported [27].

In conclusion, resistance to carbapenems in *K. pneumoniae* in Greece seems to be due to the contemporary spread of two resistance mechanisms: the already established VIM type metalloenzyme characterised mainly by polyclonal spread and transferable plasmids [23] and the KPC-2 shown in our study to spread mainly monoclonally in an epidemic mode. Currently, there are no confirmed clinical data to assess the possible implication of the presence of carbapenemase-producing organisms in infections treated with carbapenems [23,28]. However, our data emphasise the urgent need for implementation of public health measures in the field of infection control and antibiotic consumption. They also underline the inadequacy of the surveillance systems that are exclusively based on antibiotic susceptibility data in elucidating the resistance phenomenon, and thus emphasise the need to supplement these systems with the surveillance of the resistance mechanisms at the molecular level. Understanding these complex processes at the hospital, country, national and even international level is an important prerequisite for instituting properly designed public health measures.

* The following hospitals of the Greek System for the Surveillance of Antimicrobial Resistance (http://www.mednet.gr/whonet/) participated in the present study:

"Venizelio" General Hospital, Herakleion, Crete (M Ventouri, V Liakou); "Onassio" Cardiac Surgery Centre, Athens (A Tasouli, S Geroulanos); General Hospital of Chania, Crete (G Alevraki, K Tsaferaki); "Evangelismos" General Hospital, Athens (E Platsouka, O Paniara); "Agios Panteleimon" General Hospital, Nikaia, Piraeus (P Karle, D Mylona-Petropoulou);"Agios Pavlos" General Hospital, Thessaloniki (H Kakasi, B Galanopoulou-Gkiousera); Naval Hospital, Athens (E Mournianakis, G Tottos); "Agia Olga" General Hospital, Athens (I Mellas, Z Roussou); 251 Air Force Hospital, Athens (H Douma-Zaharopoulou, G Katsanis); "Amalia Flemming" General Hospital, Melissia, Athens (A Karaitianou, G Kouppari); "Tzannio" General Hospital, Piraeus (O Zarkotou, K Themeli-Digalaki); Emergency Hospital "KAT", Athens (S Tsiplakou, V Papaioannou); Hippocration General Hosapital, Athens (A Xanthaki, M Toutouza); "G. Gennimatas" General Hospital, Athens (H Vagiakou, H Malamou-Ladas); "Asklipiio" General Hospital, Voula, Piraeus (D Kairis, X Koutsia); "Sotiria" General Hospital, Athens (H Moraitou, S Kanavaki); "Sismanoglio General Hospital, Athens (M Kanellopoulou, E Papafrangas); "Demokritus" University General Hospital, Aleksandroupoli (M Panopoulou, S Ktenidou-Kartali); General Hospital of Ierapetra, Ierapetra, Crete (M Kotsidoniotali); "Attiko" University General Hospital, Athens (S Vourli, L Zerva); "Laiko" General Hospital, Athens (A Pantazatou, A Avlami).

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References

1. Queenan AM, Bush K. Carbapenemases: the versatile β-lactamases. J Clin Microbiol Rev. 2007;20:440-58
2. Tegmark Wisell K, Hæggman S, Gezelius L, Thompson O, Gustafsson I, Ripa T, et al. Identification of Klebsiella pneumoniae carbapenemase in Sweden. Euro Surveill. 2007;12(51):pii=3333. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=3333
3. Cuzon G, Naas T, Demachy MC, Nordmann P. Plasmid-mediated carbapenem-hydrolyzing beta-lactamase KPC-2 in Klebsiella pneumoniae isolate from Greece. Antimicrob Agents Chemother. 2008;52(2):796-7. Epub 2007 Dec 3.

4. Clinical and Laboratory Standards Institute. 2007. Performance Standards for Antimicrobial Susceptibility Testing – 17th Informational Supplement; Approved Standard M100-S17. Clinical and Laboratory Standards Institute, Wayne, PA.

5. Lee K, Chong Y, Shin HB, Kim YA, Yong D, Yum JH. Modified Hodge and EDTA-disk synergy tests to screen metallo-beta-lactamase-producing strains of Pseudomonas and Acinetobacter species. Clin Microbiol Infect. 2001;7(2):88-91.

6. Giakkoupi P, Xanthaki A, Kanelopoulou M, Vlahaki A, Miriagou V, Kontou S, et al. VIM-1 metallo-β-lactamase-producing Klebsiella pneumoniae strains in Greek hospitals. J Clin Microbiol. 2003;41(8):3893-6.

7. Vatopoulos AC, Phillippon A, Tsouvelekis LS, Komninou Z, Legakis NJ. Prevalence of a transferable SHV 5 type β lactamase in clinical isolates of Klebsiella pneumoniae and Escherichia coli in Greece. J Antimicrob Chemother. 1990;26(5):635-48.

8. Tenover FC, Kalsi RK, Williams PP, Carey RB, Stocker S, Lonsway D, et al. 2006 Carbapenem resistance in Klebsiella pneumoniae not detected by automated susceptibility testing. Emerg Infect Dis. 2006;12(8):1209-13.

9. Petrella S, Ziental-Gelus N, Mayer C, Renard M, Jarlier V, Sougakoff W. Genetic and structural insights into the dissemination potential of the extremely broad-spectrum class A β-lactamase KPC-2 identified in an Escherichia coli strain and an enterobacter cloacae strain isolated from the same patient in France. Antimicrob Agents Chemother. 2008;52(10):3725-36. Epub 2008 Jul 14.

10. Wei ZQ, Du XX, Yu YS, Shen P, Chen YG, Li LJ. Plasmid-mediated KPC-2 in a Klebsiella pneumoniae isolate from China. Antimicrob Agents Chemother. 2007;51(2):763-5. Epub 2006 Dec 4.

11. Chiang T, Mariano N, Urban C, Colon-Urban R, Grenner L, Eng RH, et al. 2007. Identification of carbapenem-resistant K.pneumoniae harboring KPC enzymes in New Jersey. Microb Drug Resist. 2007;13(4):235-39.

12. Smith Moland E, Hanson ND, Herrera VL, Black JA, Lockhart TJ, Hossain A, et al. Plasmid-mediated, carbapenem-hydrolysing β_-lactamase, KPC-2, in Klebsiella pneumoniae isolates. J Antimicrob Chemother. 2003;51(3):711-4.

13. Leavitt A, Navon-Venezia S, Chmelnitsky I, Schwaber MJ, Carmeli Y. 2007. Emergence of KPC-2 and KPC-3 in carbapenem-resistant Klebsiella pneumoniae strains in an Israeli hospital. Antimicrob Agents Chemother. 2007;51(8):3026-9. Epub 2007 Jun 11.

14. Navon-Venezia S, Chmelnitsky I, Leavitt A, Schwaber MJ, Schwartz D, Carmeli Y. Plasmid-mediated imipenem-hydrolyzing enzyme KPC-2 among multiple carbapenem-resistant Escherichia coli clones in Israel. Antimicrob Agents Chemother. 2006;50(9):3098-101.

15. Anderson KF, Lonsway DR, Rasheed JK, Biddle J, Jensen B, McDougal LK, et al. Evaluation of methods to identify the Klebsiella pneumoniae carbapenemase in Enterobacteriaceae. J Clin Microbiol. 2007;45(8):2723-5. Epub 2007 Jun 20.

16. Galani I, Rekatsina PD, Hatzaki D, Plachouras D, Souli M, Giamarellou H. Evaluation of different laboratory tests for the detection of metallo-beta-lactamase production in Enterobacteriaceae. J Antimicrob Chemother. 2008;61(3):548-53. Epub 2008 Jan 25.

17. Kotlovsky T, Shalginov R, Austin L, Sprecher H. Rapid detection of blaKPC-positive Klebsiella pneumoniae in a clinical setting. Eur J Clin Microbiol Infect Dis. 2009 Mar;28(3):309-11. Epub 2008 Aug 22

18. Yigit H, Queenan AM, Anderson GJ, Domenech-Sanchez A, Biddle JW, Steward CD, et al. Novel carbapenem-hydrolyzing β-lactamase, KPC-1, from a carbapenem-resistant strain of Klebsiella pneumoniae. Antimicrob Agents Chemother. 2001;45(4):1151-61.

19. Doi Y, Potoski BA, Adams-Haduch JM, Sidjabat HE, Pasculle AW, Paterson DL. Simple Disk-Based Method for Detection of KPC-Type {beta}-Lactamase by use of a boronic acid compound. J Clin Microbiol. 2008 Dec;46(12):4083-6. Epub 2008 Oct 15.

20. Tsakris A, Kristo I, Poulou A, Markou F, Ikonomidis A, Pournaras S. First occurence of KPC-2-possessing Klebsiella pneumoniae in a Greek hospital and recommendation for detection with boronic acid disc tests. J Antimicrob Chemother. 2008 Dec;62(6):1257-60. Epub 2008 Sep 4.

21. Tsakris A, Kristo I, Poulou A, Themeli-Digalaki K, Ikonomidis A, Petropoulou D, et al. Evaluation of boronic acid disk tests for differentiating KPC-possessing Klebsiella pneumoniae isolates in the clinical laboratory. J Clin Microbiol. 2009;47(2):362-7. Epub 2008 Dec 10

22. Maltezou HC, Giakkoupi P, Maragos A, Bolikas M, Raftopoulos V, Papahatzaki H, et al. Outbreak of infections due to KPC-2-producing Klebsiella pneumoniae in a hospital in Crete (Greece). J Infect. 2009;58(3):213-9. Epub 2009 Feb 26.

23. Vatopoulos A. 2008 High rates of metallo-β-lactamase-producing Klebsiella pneumoniae in Greece. A review of the current evidence. EuroSurveill. 2008;13(4):pii= 8023; Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=8023

24. Vander Stichele RH, Elseviers MM, Ferech M, Blot S, Goossens H. Hospital consumption of antibiotics in 15 European countries: results of the ESAC retrospective data collection (1997-2002). J Antimicrob Chemother. 2006 ;58(1):159-67. Epub 2006 May 12

25. Bratu S, Mooty M, Nichani S, Landman D, Gullans C, Pettinato B, et al. Emergence of KPC-possessing Klebsiella pneumoniae in Brooklyn, New York: epidemiology and recommendations for detection. Antimicrob Agents Chemother. 2005l;49(7):3018-20.

26. Cai JC, Zhou HW, Zhang R, Chen GX. 2008. Emergence of Serratia marcescens, Klebsiella pneumoniae, and Escherichia coli isolates possessing the plasmid-mediated carbapenem-hydrolyzing beta-lactamase KPC-2 in intensive care units of a Chinese hospital. Antimicrob Agents Chemother. 2008;52(6):2014-8. Epub 2008 Mar 10.

27. Woodford N, Zhang J, Warner M, Kaufmann ME, Matos J, MacDonald A, et al. Arrival of Klebsiella pneumoniae producing KPC carbapenemase in the United Kingdom. J Antimicrob Chemother. 2008;62(6):1261-4. Epub 2008 Sep 23.

28. Nordmann P, Cuzon G, Naas T. The real threat of Klebsiella pneumoniae carbapenemase-producing bacteria. Lancet Infect Dis. 2009;9:228-36.

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