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## **INFLUENZA AS A HEALTH PROBLEM OF SEA TRAVELLERS**

ANETA NITSCH-OSUCH<sup>1</sup>

### **ABSTRACT**

Traveling people may play an important role in spreading of influenza viruses in the world. The risk for exposure to influenza during travel depends on the time of year and destination, and the way of traveling (individual trip or organized excursion with a large group of people, especially coming from many different countries). Results of recent studies indicated that influenza may be the most frequent vaccine-preventable infectious disease with symptoms from respiratory tract. It is estimated that the attack rate of influenza in intercontinental travelers is 1%.

The aim of the article is to describe current recommendations for travelers, especially sea travelers (passengers and crew), concerning influenza prophylaxis, treatment and possible outbreak control.

Guidelines for the prevention and control of influenza –like illness among passengers and crew members on cruise ships have also been described.

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<sup>1</sup> Department of Family Medicine, Medical University of Warsaw  
Banacha 1a street, 02-097 Warszawa  
Tel.+48 (022) 5992 190, Fax +48 22 5992 178  
E-mail: [anitsch@amwaw.edu.pl](mailto:anitsch@amwaw.edu.pl)

## INTRODUCTION

Influenza is an acute infectious disease caused by influenza virus A, B or C. The influenza virus belongs to Orthomyxoviridae and is spread by a droplet way. Influenza is a serious disease because of its possible impact on the health of individuals (severe complications, especially in patients from risk groups), and economic loss for individuals and the community [1].

Influenza may spread as an epidemic or a pandemic disease which requires a good virological and epidemiological surveillance – especially nowadays when highly pathogenic A (H5N1) strain is typed as one of potential future pandemic viruses [2,3].

Traveling people may play an important role in spreading influenza viruses in the world [2,3]. The risk for exposure to influenza during travel depends on the season of the year, the destination, and the way of travelling (individual trip or organized excursion with a large group of people, especially if they are coming from many different countries). Results of recent studies indicated that influenza may be the most important vaccine-preventable infectious disease with symptoms from respiratory tract [4]. It is estimated that the attack rate of influenza in intercontinental travellers is 1% [5].

The aim of the article is to describe current recommendations for travellers, especially see travellers (passengers and crews of ships), concerning influenza prophylaxis, treatment and outbreak control.

## GEOGRAPHICAL DISTRIBUTION

Influenza distribution varies in the world varies [6-8]:

- in the Northern Hemisphere epidemics tend to occur in winter months from November to March, mainly in January and February;
- in Southern Hemisphere epidemics occur in from May to October, mainly in June and July;
- in the tropics the disease is present at any time of the year, especially during the rainy season.

Geographical and seasonal pattern of the spread of influenza defines recommendations for the time of vaccination of travellers.

## GENERAL RECOMMENDATIONS FOR VACCINATIONS

Vaccinations against influenza are recommended to [6-8]:

- all travellers belonging to risk groups regarding complications (table 1);
- if there are no medical contraindications – all travellers who want to avoid the disease and its complications;
- travellers from Northern Hemisphere going to Southern Hemisphere from April to September, and those coming from Southern Hemisphere to Northern Hemisphere from November to March;
- large groups of people (pilgrims, participants of cruises, especially long term cruises);
- people travelling to the tropics (all the year).

Table 1. Risk groups for whom annually vaccination against influenza is recommended [6].

Persons aged > 50 years
Healthy children aged 0-59 months
Children older than 6 months with chronic diseases of respiratory tract and cardiovascular system
Children aged < 18 years chronically treated with aspirin
Residents of nursing homes
Individuals with chronic cardiopulmonary disorders
Persons who require regular medical care for chronic metabolic, renal diseases or hemoglobinopathies
Patients with immunosuppression (including HIV)
Pregnant women
Health care workers
Household contacts and out-of-home caregivers of children up to the age of 23 months
Household contacts of persons at high risk for complications of influenza

The US Centers for Disease Control and Prevention recommend that:

- travelers departing for the tropics at any time of the year or to the Southern Hemisphere from May to October should consider vaccination if they were not vaccinated the previous fall or winter;

- travelers who before departure receive the previous seasons vaccine should be vaccinated again when the next season's vaccine becomes available [8].

The most recent vaccine available at home country may not cover all of the strains encountered by the traveller. If strains are known to be circulating in the destination country that are not covered by the available vaccine, the traveller should consider obtaining the appropriate vaccine after his or her arrival [8].

In adults protection begins roughly 2 weeks after vaccination and lasts 6 months or more. Two doses given at least 1 month apart is necessary to obtain a satisfactory antibody response in previously unvaccinated children under 9 years. Vaccinations should be planned at least two weeks before travel in adults and 6 weeks before travel in previously not vaccinated children aged less than 9 years [8].

Table 2. Comparison of live attenuated influenza vaccine (LAIV) with inactivated influenza vaccine (TIV) [6].

	TIV	LAIV
Route of administration	intramuscular injection	intranasal spray
Approved age and risk groups	aged > 6 months	healthy persons 5-49 years
Type of virus	inactivated virus	live attenuated virus
Spacing with inactivated vaccines	Anytime	anytime
Spacing with life vaccines	any time	prudent to space 4 weeks apart or give simultaneously
Use in immunocompromised	Recommended	contraindicated
Use in children with chronic salicylate therapy	Recommended	contraindicated
Can be administered to persons at high Risk for influenza-related complications	Recommended	not recommended
Use for family members or close contacts of immunosuppressed persons not Requiring a protected environment	Yes	yes
Use for family members or close contacts of severely immunosuppressed persons Requiring a protected environment	Preferred	yes
Use during pregnancy	Recommended	contraindicated
Anaphylactic allergy to eggs	Contraindicated	contraindicated

The trivalent inactivated vaccine (TIV) against influenza is recommended for mass vaccination programs, while live attenuated vaccine (LAIV) may be given only to healthy people aged 5-49 years and it is not licensed in all countries. Main differences between vaccines (TIV and LAIV) are presented in table 2 [6].

Influenza vaccination of travellers provides [6-9]:

- a chance to avoid the disease and its complications (because of a short incubation period of the disease (1-3 days), exposure during travel can disrupt a business trip or vacation);
- a chance to reduce transfer (introducing) the disease to home country,
- a chance to reduce the risk of its transfer to the destination country,
- a chance to limit spreading the disease worldwide,
- a chance to reduce the risk of antigenic shift between seasonal influenza virus and avian influenza virus.

It has been proved that this vaccination is not only cost-effective but also cost-saving [10].

## INFLUENZA OUTBREAKS ON SHIPS

For many years cruise ships have been known for outbreaks of gastrointestinal diseases, but more recently respiratory tract infections, including influenza, have been added to a list of diseases affecting sea travellers. Close contact with high transmission has been documented on cruise ships. Examples of influenza outbreaks there are described below.

In April 1984, a large outbreak of influenza-like and diarrheal illness took place on a ship cruising to ports in southern Europe and northern Africa. Laboratory tests revealed that the outbreak was caused by multiple pathogens, including influenza B virus infection (confirmed in 14 cases) and influenza A virus infection (confirmed in 4 cases). A cohort study of 418 passengers was made by postal questionnaire, 391 returned interviews, and among them 86% reported they had been affected [11].

An outbreak of influenza A (H3N2) occurred aboard a US Navy ship in February although 95% of the crew had been appropriately vaccinated. Virus isolated from ill crew members was antigenically distinct from the vaccination strain. With the attack rate of 42% (232/548 of crew members became ill), this outbreak demonstrates the potential for rapid spread of influenza in a confined population and the impact subsequent illness may have upon the workplace. Ill members of the ship missed 106 working days, additional 8 work days were lost by probable cases; one patient must have been evacuated by helicopter because of a severe chest pain as a result of infection.

After influenza A was identified in the crew, amantadine, 100 mg twice a day for 5 days was offered to all unvaccinated persons (until the outbreak subsided) and those in the first days of illness. A total of 59 persons chose to take the antiviral drug, 49 for therapy and 10 for prophylaxis. A total of 28 unvaccinated crew members were onboard, 11 (61%) of 18 unvaccinated persons who did not take amantadine met the criteria for influenza, but none of 10 unvaccinated persons who took amantadine prophylaxis had influenza-like symptoms. This outbreak demonstrates the potential for rapid spread of influenza A through a confined population despite appropriate vaccination (since 1954 annual immunization program is realized on US Navy). This outbreak also demonstrates the role of stockpiling of antiviral drugs on ships – which should be used in case of outbreak [12].

In 1997, influenza-like disease was spread among passengers on North American cruises. There had been reviewed 1 ship medical records from 3 cruises from mid-August till late September. The outbreak probably began among Australian passengers on cruise 1 (31 August-10 September). During cruise 2 (11-20 September), 17% of 1284 passengers reported symptoms of acute respiratory infection (ARI), among them 77% were aged > 65 years, and 26% had other identified risk factors for respiratory complications. An influenza strain not previously identified in North America, was isolated. Epidemiological investigations resulted in conclusion that an “off-season” influenza outbreak occurred among international travellers and crew on a board of this cruise ship. This outbreak proved that summertime influenza outbreaks among passengers and crew members on cruise ships traveling in large groups can pose a risk for exposure to influenza viruses, even when the group is traveling in regions where influenza is not in seasonal circulation [13].

In June-August 1998, CDC and Health Canada began investigating reports of febrile respiratory illness and associated pneumonia among summer land and sea travelers to Alaska and the Yukon Territory. Epidemiological and laboratory evidence has implicated influenza A virus as the etiologic agent of the outbreak. Prospective surveillance and retrospective case-finding have identified 5361 cases of ARI, among them 35% cases in tourists and tourism workers, and additional 3,2% cases were confirmed radiographically as pneumonia. The median age of all persons with ARI was 60 (range 1-91 years). Most cases of ARI were observed among smaller groups of tourists sharing transportation and accommodation on overland tours, and among passengers and crew members on cruise ships. Several cruises lines have initiated active surveillance for respiratory illness, organized vaccination campaigns for crew members and acquired stocks of influenza antiviral medications [14-16].

During June and July 2000, an outbreak of respiratory illness occurred on the m/s Rotterdam during a 12-day Baltic cruise from the United Kingdom to Germany via

Russia. On the board there were 1311 passengers, primarily from USA, 506 crew members from many countries. Results of rapid test were negative for influenza viruses, but immunofluorescence staining and viral culture results implicated influenza B infection as a cause of the outbreak.

A total of 64 (13%) crew members and 54 (4%) passengers were identified with ARI during the cruise. The median age of ill crew members was 32 years and of passengers 69 years. By cross-referencing crew duties, cabin locations of ill crew members and passengers, and dates of illness, medical staff identified the potential index case-patient as a 78-year old US passenger who boarded the ship ill (with symptoms of acute respiratory infection) in London [17,18].

In September 2000, an outbreak of influenza-like illness was reported on a cruise ship between Sydney and Noumea with 1100 passengers and 400 crew on board. The cruise coincided with the peak influenza period in Sydney. Laboratory testing of passengers and crew indicated that both influenza A and B viruses had been identified on the ship. Morbidity was high with 40 passengers hospitalized, two of them died. According to a questionnaire set to passengers 3 weeks after a cruise, 37% of them reported suffering from an influenza-like illness (cough, fever, myalgia), 63% had seen a doctor for the illness related to a cruise. One third of passengers reported a vaccination against influenza in 2000, but neither the morbidity nor hospitality among them was different from unvaccinated persons [19]. Early suspicion of a potential influenza outbreak among crew members and rapid implementation of a respiratory illness control protocol probably limited the size of the outbreak.

#### GUIDELINES FOR THE PREVENTION AND CONTROL OF INFLUENZA-LIKE ILLNESS AMONG PASSENGERS AND CREWS ON CRUISE SHIPS (CDC, 1999)

Medical staff of cruise should routinely be educated about clinical, diagnostic and treatment aspects of respiratory illnesses, their surveillance, prevention, control, with particular focus on influenza and pneumonia [20].

Key elements of the protocol which may be used for prevention and control of influenza outbreak on ships should include [20]:

1. implementation of an active and passive surveillance using standard case definition;
2. use of targeted rapid influenza diagnostic testing and viral cultures to confirm cases of influenza virus infection;

3. isolation of crew members meeting the ARI case definition or those with confirmed influenza;
4. use of antiviral agents for treatment and, if indicated, for prophylaxis (table 3);
5. monitoring the interventions results.

Both passengers and crew members can serve as potential reservoirs of influenza infection. Vaccination against influenza should be strongly recommended to all travellers, especially at the age > 65 years and other risk factors for influenza complications. Cruise lines should attempt to achieve at least 80% vaccination rate among crew members on each ship each year. Annual vaccination against influenza should be done among military services, including crew members of the navy.

Including of antiviral in the list of drugs in the ship's medicine chest is recommended, but it should be underlined that nowadays the adamantanes are not drugs recommended for treatment and prophylaxis of seasonal influenza because more than 90% currently circulating strains are resistant to this group of drugs (including amantadine and rimantadine) [8]. Modern antivirals belong to a group of neuraminidase inhibitors (zanamivir and oseltamivir), should be given for treatment. But therapy should be started not longer than 36-48 hours after the onset of symptoms (table 3) [8].

Table. 3. Antiviral drugs (neuraminidase inhibitors) in prophylaxis and treatment of influenza [6].

	Oseltamivir	zanamivir
Licensed for treatment of seasonal influenza	Yes	yes
Licensed for prophylaxis of seasonal influenza	Yes	yes
Route of administration	Oral	inhalation
Age limits	allowed for individuals > 1 year	allowed for individuals > 5 years
Duration of treatment	5 days	5 days
Duration of contact prophylaxis	10 days	10 days
Doses for treatment	in children dose varies by child's weight In adults 2x75 mg	2x 2 inhalations
Doses for prophylaxis	in children dose varies by child's weight In adults 1x75 mg	1x2 inhalations
Bioavailability	high (80%)	low (10%)
Special comments	special awareness in teenagers (possible behavioral and psychiatric changes)	special awareness in patients with bronchospasm predisposing conditions



## SUMMARY

Influenza may be a health problem among travellers, including see travellers. Vaccination against this disease should be more popular in this group of people [20].

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