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Mini Review

Epidemic Flu Viruses

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Abstract

For the emergency created by the epidemic of "influence of the pigs" in Mexico it was correct not to create alarmism being victims of a bad information [1]. The possibility that the virus arrives in other parts of the world is real as for all the types of influence virus [2]. In order that a strain has a wide distribution, its antigenic characteristics must ensure that it escapes the neutralization of antibodies of the host and of the surrounding population [3]. So the outbreaks will happen with those strains that have dominant antigens that fit the deficiency, or better, the absences of antibody in the population [4]. It seems, in conclusion that the flu virus shows an ability and an aptitude for survival built on the possibility of emergence of new models that allow the virus being confused easily through populations still partly immune to previous antigenic forms [5]. According to this view, the changes in the influenza A can be designed in single meaning, in the context of a principle and of an evolutionary progress, from Burnet named immunological drift or steering immunology [6]. The antiviral drugs (inhibitors of the neuraminidase, receptor of the virus surface) should be assumed within 48 hours by the appearance of the influence symptoms and for the subjects that have had a close contact with people infected by the flu virus. The vaccination against the influence is the most effective method to prevent the illness. From the moment that we find the isolation of a new flu virus, we must wait for the preparation of a new specific vaccine that will be ready for the next influence season [7].

Keywords: *Flu Virus; Neuraminidase; Influenza Virus*

Introduction

Influenza tends to be seasonal, with peaks typically between the end of autumn and early spring. The associated signs and symptoms, such as headaches, fever, chills, muscle aches, weakness, rhinitis, pharyngotonsillitis and cough, may be more severe than those of the common cold.

Influenza virus is a very common virus, responsible for respiratory infections that can cause mild to very severe, sometimes lethal, malaise. The influenza test detects the presence of the influenza virus in a sample of respiratory secretions.

There are two types of influenza viruses, A and B, responsible for epidemic and pandemic flu forms. The type C virus causes mild discomfort and is not sufficiently pathogenic to cause epidemics. There are numerous subtypes of influenza A virus, which derive their name from the type of two components of the virus present, the hemagglutinin (H) and the neuraminidase (N). It is relevant to emphasize the role of hemagglutinin and neuraminidase proteins in influenza viruses infectivity.

In general, the diagnosis of influenza does not require laboratory analysis, especially if it occurs in the periods during which the influenza peaks are present (Figure 1). However, the influenza test can be useful if there is a need to exclude other diseases, limiting the use of antibiotics (unnecessary in the case of influenza) and favouring the use of more appropriate therapies (such as antiviral drugs).

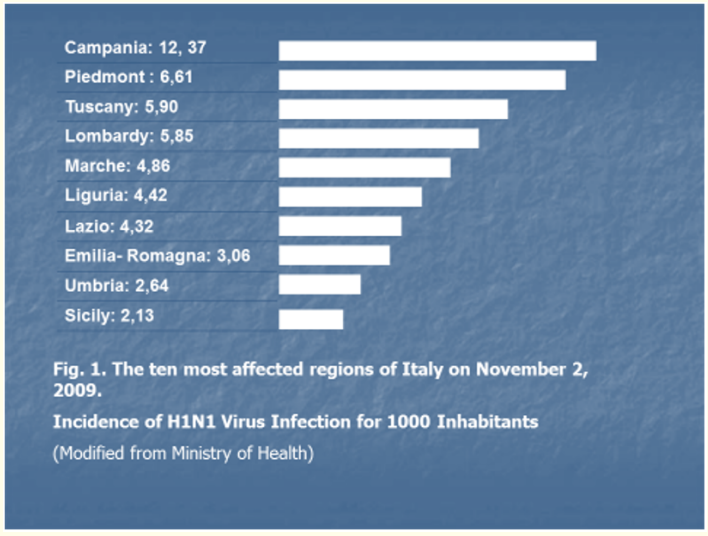

Figure 1: *The ten most affected regions of Italy on November 2, 2009. Incidence of H1N1 virus infection for 1000 inhabitants (Modified from Ministry of Health).*

Source: From Journal of Cellular Physiology 2012 Jul;227(7): 2813-7. doi: 10.1002/jcp.23030.

The influenza test can also be useful if an outbreak is suspected in confined areas, such as hospitals, nursing homes, schools. Finally, the influenza test may have the purpose of providing epidemiological information to national and international health surveillance bodies [8].

Since influenza viruses change every year, it is important to monitor the strain and type of virus present for each influenza season in order to gather information useful for the formulation of vaccines and for the monitoring of any anti-drug resistant viral strains.

Rapid diagnostic test of influenza virus antigens - used to detect influenza virus antigens in respiratory tract samples. The main disadvantage of this type of test is the high rate of false negative results. These tests have a limited sensitivity and generally detect about 50 - 70% of cases of influenza [9]. Therefore even in the case of negative results, it is however recommended to treat the patient with antiviral drugs. The confirmation test can be performed through a more sensitive culture or molecular examination. Sometimes this test can also provide false positive results.

Molecular tests (RT-PCR) - these tests detect the presence of the viral genetic material (RNA) in the sample. They are generally more sensitive and specific than rapid tests and identify, depending on the type of test used, 66-100% of cases of influenza [10]. Some methods allow the detection at the same time of different species of virus responsible for respiratory infections, such as influenza virus, respiratory syncytial virus and rhinovirus.

The culture test is able to detect influenza viruses of type A and B and to determine the virus strain and subtype. These tests are useful for the formulation of a vaccine believed to be usable in the following period based on the presence of emerging and potentially pandemic viral strains (Figure 2). The culture test can detect the presence of other respiratory tract viruses.

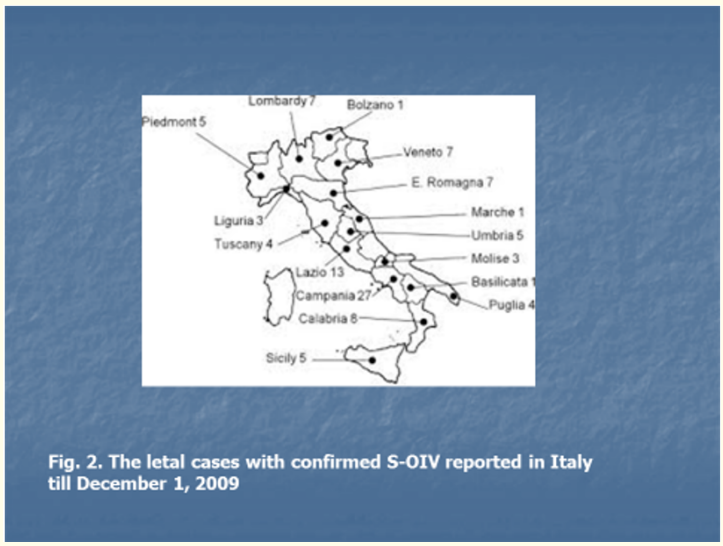

Figure 2: *The letal cases with confirmed S-OIV reported in Italy till December 1, 2009.*
Source: From Journal of Cellular Physiology 2012 Jul;227(7):2813-7. doi: 10.1002/jcp.23030.

The influenza vaccines produced each year are produced on the basis of predictions regarding the viral strain that will most likely be most represented during that particular influenza season. These evaluations derive from epidemiological observations performed by experts in the field. Generally these vaccines are made with attenuated forms of the virus or inactive virus, and are directed against two strains of influenza A virus and one of B.

Influenza viruses, passing through communities all over the world, undergo spontaneous changes (called "antigenic drift") that allow to evade protective antibodies formed during previous infections and vaccinations. The amount of "antigenic drift" varies from year to year. The most important antigenic movements, known as "antigenic steering", lead to more serious diseases because more people are susceptible to the virus (antigenic shift according to Burnet).

The rapidly changing virus and a complex immune response

To learn more about "original antigenic sin", the National Institute of Allergy and Infectious Diseases (NIAID) is evaluating proposals for a study that would follow children for up to 7 years to take care how their initial influenza exposure plays a role on later immune responses. Antibody levels to the second surface protein of the virus (neuraminidase) better correlate with protection from disease.

The first influenza virus or flu vaccine children experience has a deep impact on the breathing and level of their immune responses to later infections with different flu strains.

The 1918 influenza pandemic was caused by a virus subtype known as H1N1. The death rate was much higher than normal among young adults that generally die less from influenza. Exposure to H1N1 triggered strong antibody responses to a different subtype of virus (H3N8) which they had met a few decades before when they were children. The immune responses are determined from the previous experience and are responsible to miss a new virus.

Importance of vaccines

Vaccines reduce cases of infection and consequently the need to resort to antibiotics. For example, we report what was argued by Lord O'Neill who leads the Review on Anti-Microbial Resistance (AMR) (May 2016) "An anti-pneumococcal conjugate vaccine, which is already used in different parts of the world, could largely prevent the 800,000 annual deaths of children under five years of age from Streptococcus pneumoniae and could also prevent over 11 million days of antibiotic use of these children, reducing the likelihood of developing resistance".

Other initiatives for the fight against AMR

New diagnostic tests to avoid unnecessary administration of antibiotics.

Ready diagnosis to settle the type of viral or bacterial infection avoiding unnecessary antibiotic prescriptions.

Identification of the most suitable antibiotics to eradicate a bacterial infection thus limiting the appearance of resistant strains.

Ciprofloxacin or levofloxacin are major drugs used in urinary, respiratory and bone infections resistant to other antibiotics.

Procalcitonin

It has been shown that the use of bacterial infection diagnosis algorithms and antibiotic therapy (Antibiotic Stewardship) guided by procalcitonin (PCT) can significantly reduce antibiotic exposure. It is therefore possible to suppose an indirect beneficiary in terms of antibiotic resistance reduction resulting from the use of PCT.

Potential new epidemic Flu virus

Across China, the virus that could spark the next pandemic is already circulating. It's a bird flu called H7N9, and true to its name, it mostly infects poultry. Lately, however, it's started jumping from chickens to humans more readily - bad news, because the virus is a killer. During a recent spike, 88% of people infected got pneumonia, three-quarters ended up in intensive care with severe respiratory problems, and 41% died [11].

Who's afraid of the Flu?

For the first time in history, the world is fighting a pandemic flu before it becomes a full-fledged catastrophe. But the real battle is the one in our heads.

Composition of flu vaccines 2018-2019

- Tetravalent vaccine
- Antigen analogous to A/Michigan/45/2015 (H1N1) strain
- Antigen analogous to A/Hong Kong/4801/2014 (H3N2) strain
- Antigen analogous to B/Brisbane/60/2008 (Victoria lineage)
- Antigen analogous to B/Phuket/3073/2013 (Yamagata lineage)
- In the 2016-2017 formulation, the antigen analogous to the A/Michigan/45/2015 (H1N1) strain replaced the antigen analogous to the A/California/7/2009 (H1N1) strain; all the other antigens are the same as in last year's vaccine.

Influenza vaccine is recommended in children over 6 months and in the elderly (Figure 3). Even people at greater risk of developing complications should undergo the vaccine, including people housed in nursing homes, pregnant women, people with asthma, chronic obstructive pulmonary disease, heart disease, liver disease and kidney disease.

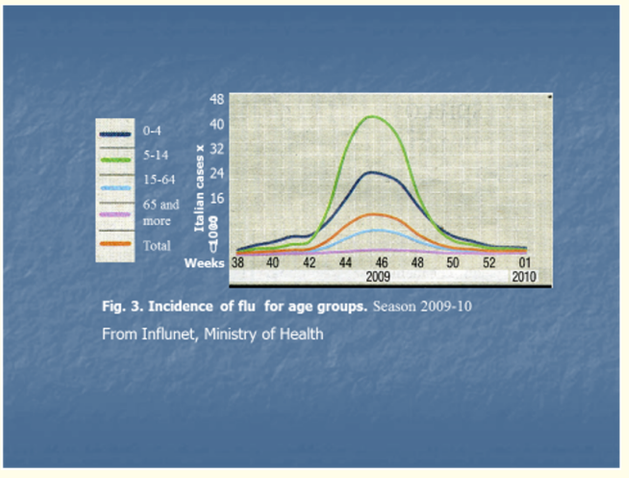

Fig. 3. Incidence of flu for age groups. Season 2009-10
From Influnet, Ministry of Health

Figure 3: *Incidence of flu for age groups. Season 2009-10 from Influnet, Ministry of Health. Source: From Journal of Cellular Physiology 2012 Jul;227(7):2813-7. doi: 10.1002/jcp.23030.*

Conclusions

The findings of severe respiratory diseases with the circulation of H1N1 influenza virus represent the potential pandemic impact and therefore the importance to reduce the spreading infection by vaccination. Since last year there was a surprising virulence of the year's flu it is crucial to target the efforts for an universal flu vaccine after a century of the 1918 deadly pandemic influence.

Acknowledgments

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Bibliography

1. Tarro G. "Epidemic Flu Viruses". *SciFed Journal of Flu Science* 1 (2017): 1.
2. Tarro G. "The Viruses, Latency and Malignancy". *EC Microbiology* 12.1 (2017): 31-36.
3. Tarro G. "Vaccines For Human Viral Diseases As Well As for Oncogenic Non-Viral Antigens". *Journal of Clinical Immunology Research* 1.1 (2017): 1-2.
4. Tarro G. "From sequence of tumor liberated protein (TLP) to potential targets for diagnosis and therapy". *Integrative Molecular Medicine* 4.3 (2017): 1-3.
5. Tarro G. "Origin of the HIV and Evolutionary History of the Viruses". *EC Microbiology* 7.3 (2017): 87-91.
6. Zimmer SM and Burke DS. "Historical perspective--Emergence of influenza A (H1N1) viruses". *New England Journal of Medicine* 361.3 (2009): 279-285.
7. Esposito C., *et al*. "Tracking the 2009 H1N1 influenza virus in the Italian region Campania". *Journal of Cellular Physiology* 227.7 (2012): 2813-2817.
8. Ryu SW., *et al*. "Comparison of two new generation influenza rapid diagnostic tests with instrument-based digital readout systems for influenza virus detection". *British Journal of Biomedical Science* 73.3 (2016): 115-120.
9. Centers for Disease Control and Prevention. "Influenza Virus Testing Methods" (2016).
10. Centers for Disease Control and Prevention. "Guidance for Clinical on the Use of RT-PCR and Other Molecular Assays for Diagnosis of Influenza Virus Infection" (2016).
11. Paules CI and Fauci AS. "A Universal Flu Vaccine is Vital". *Scientific American* 318.2 (2018): 8.

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