THE IMMUNE RESPONSE TO THE PANDEMIC VIRUS STRAIN INFECTION OF THE NOVEL INFLUENZA H1N1

Authors: Tsintou Magdalini*1 – Liakou Penelope*2

*1MSd, Medical School, University of Thessaly. Editor in Chief, reviewer, webmaster.

*2MD, Biopathologist. Associate editor, reviewer.

Abstract.

The H1N1 strain of the novel influenza A, is a triple reassorted virus which is antigenically different from any known influenza virus and the human population is substantially deprived of immunity toward the concrete strain. The H1N1 virus is easily replicated in the macrophagous cells and both the innate and the adoptive immune responses aim to its elimination. The clinical image is usually mild and self-restricted, however a small percentage of the patients presents acute respiratory failure. In this article, the importance of the inflammatory mediators and also the adoptive immune responses of the critical or serious condition patients who was infected with the H1N1 virus, are reported.

1. Introduction.

The novel pandemic influenza A virus (H1N1) was isolated in April 2009 and causes the first influenza pandemic of the 21st century. This novel strain is antigenically different from all the seasonal influenza viruses and the human population is substantially immunity deprived against this novel virus. The H1N1 emanates from a swine influenza A strain. After multiple reassortments in the swine, it was transported into the human [1,2]. It includes genes parts from the classic swine viruses (HA, NP, NS), from the human virus H3N2 (PB1) and from the avian viruses (PA, PB2) [1].
In most cases it causes a mild disease of the respiratory tracts with symptoms similar to those of the seasonal influenza [3,4]. However a small percentage needs to be addressed in the intensive care units because of a serious clinical condition [5,6,7]. This fact in combination with both the virus transmission ease and the high toxicity which it presents, may lead to serious repercussions for both the daily lives of the citizens and the global economy. Since beyond the high risk patients group – with a burdened medical record – for the serious disturbances appearance after the infection with the novel virus H1N1, these are also presented in a statistically important percentage of healthy people, reasonably the question arises whether this novel virus causes a disturbance of both the innate immunity and the adaptive immune responses of the infected organism.

2. **Innate and adoptive immunity after the infection with the H1N1 virus.**

The initial infection region remains the respiratory passage. Specific glycan receptors on the surface of the upper respiratory passage, bind the HA virus part [8]. Thence the virus is replicated in the macrophages which are found under the epithelium of the respiratory organs and coordinate the innate immune response development against the virus [9]. The role of the immune responses in the H1N1 elimination or their participation in the serious respiratory pathogenesis is not as yet known.

The early expression of the macrophage-derived chemokines is indicative of the innate antigenic responses. Studies in serious and also fatal cases in patients who were infected with the H5N1, the avian influenza virus, exhibited a very powerful cytokine- and IFN- immune response by the macrophages [10]. The histological findings in the mice models show a massive infiltration of immune cells into the injured lung tissues which amplify the tissue damage [11].
Consistent with previous studies in patients infected with the RSV [12] and the H5N1 [13], increased CXCL10, CCL2 and CCL4 chemokines levels also in the patients with H1N1 were found. These chemokines early expression is indicative of the innate anti-viral responses of the patients. The macrophages-produced cytokines activate the cytotoxic NK and induce the T-regulating lymphocytes. Thus the interferons (IFN5), the TNFα and the interleukins, stimulate and direct the adoptive response via the Th cells.

Since the influenza H5N1 epidemic, it was already proved that the hypercytokinaemia is characteristic of the human infections serious cases [14]. Previous reports from the seasonal influenza cases confirm the Th1 pro-inflammatory mediators increase as the TNFα, IL6, IL18 etc. [15]. The Th1 adoptive immunity participates in the intracellular micro-organisms elimination as the viruses [16].

It is known that the IFN-γ promotes both the anti-viral immunity and the respiratory passages inflammation [17]. The IL6 regulates the immune responses by inducing the T cells towards a Th17 phenotype [18]. The IL8 promotes the inflammation via both the neutrophils and the mononuclear cells recruitment to the infection region. The IL10 is an anti-inflammatory cytokine [19]. The IL9 increases and the IL13 decreases the Th17 cells differentiation [20,21]. It appears that the Th17 adoptive immunity participation is present in the infections with the virus H1N1 [22]. The Th17 adoptive immunity is known that it participates in both the body defense against the viruses and in the autoimmune and also allergic diseases inflammation [23].

3. **Conclusions.**

The participation of the concrete mediators in the inflammation process, their early increased expression in clinically serious cases of the H1N1 patients, the differentiation towards a Th1 and also a Th17 adoptive immune response of the patients and probably the
body impotence to promote the endogenous anti-inflammatory responses appear constituting useful prognostic indicators of the disease gravity. The precise role of the inflammatory mediators and the pharmaceutical Th1 and Th17 response down regulation in the animal models, will give useful answers in the acute respiratory failure pathogenesis after the infection with the H1N1 virus.

References


<table>
<thead>
<tr>
<th>Reference</th>
<th>Details</th>
</tr>
</thead>
</table>