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Adaptive Artificial Passive Immunity as a Suggested Strategy for Treatment of COVID-19 Critical Cases

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Abstract

Currently, the emergence of a novel human corona virus, SARS-CoV-2, has become a global health concern causing severe respiratory tract infections in humans. Human-to-human transmissions have been described with incubation times between 2-14 days, facilitating its spread via droplets, contaminated hands or surfaces, resulting in high spread and death rates according to date, time and place of infection. We therefore reviewed the literature on all available information about the treatment of the cases, especially critical cases to decrease the mortality rate, the spread and incubation time of the virus by using the adaptive artificial passive immunity (anti-bodies from fully recovered patients with COVID-19).

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Introduction

A novel corona virus (SARS-CoV-2) has recently developed from China with a total of 82,930 or more confirmed cases of pneumonia with 3341 total death cases (as of April 5, 2020) [1]. Together with Middle East Respiratory Syndrome (MERS) corona virus and Severe Acute Respiratory Syndrome (SARS) corona virus [2], this is the third highly pathogenic, but pandemic since March 12th 2020, human corona virus that has emerged in the last two decades. Person-to-person transmission has been confirmed in both hospital and family settings [3]. It is therefore an obligatory issue to prevent any further spread of the virus in the public and healthcare places. Transmission of corona viruses from contaminated dry surfaces has been suggested including self-inoculation of mucous membranes of the nose, eyes or mouth [4,5]. The aim of this short communication was therefore to treat the critical cases and decrease the spread and incubation period of the virus, by transferring the antibodies of fully recovered patients to other ones with some precautions.

Human Immune System and Pathogenic Infections

The defense system of the human body consists of entire organs and vessel systems like the lymph vessels, but also of individual cells and proteins. The inner and outer surfaces of the body are the first barriers against pathogenic microorganisms. These kinds of surfaces including the skin and all mucous membranes are considered a mechanical protective wall [6]. The immune system organs control the production and maturation of certain defense cells, the lymphocytes. Bone marrow and the thymus, a gland situated above the heart and behind the breast bone, are so-called primary lymphoid organs. The bone marrow produces defense cells, some of these defense cells, the so-called T lymphocytes (T stands for thymus), are differentiated in the thymus. That means that this is where they develop into cells that are capable of recognizing non-self proteins, so-called antigens [7]. The secondary lymphatic organs are the place where the defense cells do their actual work. These organs include the lymph nodes, the spleen, the tonsils and other specialized tissues in the mucous membranes of the bowel, for example. In these places, the defense cells have constant contact with non-self substances and pathogens [8]. T cells move through the body and constantly watch the surfaces of all cells for changes. To be able to do this job, they learn in the thymus which structures on cell surfaces are self and which are non-self. When coming into contact with a non-self body, T cells turn into so-called T effector cells, which trigger and regulate different defense reactions. This type of cells includes T killer cells, which can destroy cells infected with a pathogen. T helper cells are another kind of effector cells, which support other immune cells in doing their work [9]. During an immune response, B and T cells create memory cells. These are clones of the specific B and T cells that remain in the body, holding information about each threat the body has been exposed to. The immune system is thus able to mount a quicker and more powerful response if it encounters the same threat again.

Human Immune System and Vaccines

Our immune system's capacity for memory allows us also to gain immunity through vaccines, but it can also get us in trouble with autoimmune disorders or with allergies [10]. Vaccines and allergies depend on our B cells and their antibodies. Your B cells pick up the vaccine and begin making antibodies and memory cells against it. The next time your body encounters that virus or bacteria, your B cells will be ready to produce the right antibodies against it [11]. When a B cell binds this harmless particle by its specific antibody, it transforms into a plasma cell and a memory B cell. The plasma cell produces many antibodies and sets off an immune response that involves other cells, proteins and chemicals.

Human Immune System and COVID-19

However, regarding the virus as a pathogen, genetic changes occur by two principal mechanisms: mutation and recombination. Alterations in the genetic material of a virus may lead to changes in the function of viral proteins. Such changes may result in the creation of new viral serotypes or viruses of altered virulence [12]. For example, a group of researchers in Brazil recently isolated SARS-CoV-2 from two patients confirmed to have COVID-19 and sequenced the complete genomes of both samples of the virus. They found that not only did the genomes differ from each other, but they were also very different from the

genomes of the virus samples sequenced in Wuhan, China. The corona virus taken from one patient in Brazil had a genome similar to that of a virus sequenced in Germany, and the virus from the second patient resembled that of the corona virus in the United Kingdom. That means these two patients are linked to cases in Europe but not to each other. It is not uncommon for viruses to persist at low levels in the body even after someone recovers from an illness. A small study out of China suggests that the new corona virus can persist in the body for at least two weeks after symptoms of the disease clear up [13].

Precautions of Adaptive Artificial Passive Immunity Applicability

Some precautions should be taken in case of transferring antibodies from COVID recovered person to another infected one. These precautions are as follow:

1- Care about the allergy reactions that could happen.

2- Care about the amount of transferred blood containing memory and b and T cells. We can transfer the whole blood or the anti-bodies from recovered infected person to another infected person, especially low immunity people and critical cases. Try the whole blood sample replacement in case of high blood pressure and high Hb % with high CRP.

3- Use the same blood species and the same area to be sure they have almost the same criteria and it is better if blood sample is taken from the same family (if found) to be sure they have the same viral strain.

4- Follow the guidelines of blood transfer.

5- Care about the allergy foods and medicine of the person who we will take from and transfer to.

6- We may need the patient to self isolate again after recovering for 14 days and not take any blood from the cured except after the specified period.

7- Transfusion must be carried out as earlier as possible.

Conclusion

Using of antiserum or the whole blood from previously recovered patient with COVID-19 to another patient with low immunity and critical case with high precautions might improves the patient and decrease the mortality rate and decrease the incubation period so control spreading.

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