VITALS
A Weekly Safety Newsletter For Medical Transport Professionals

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What's All This Stuff About H1N1?

Influenza is a viral disease that annually kills about 36,000 people in the United States. There are three types of influenza virus: A, B, and C. Type A includes three subtypes that have been associated with epidemics and pandemics. One of these subtypes is H1N1.

The Influenza A virus is a membrane or envelope that contains eight genes, which are carried in unconnected strands of RNA. It is about 1/10,000 of a millimeter in diameter. Usually spherical, it may take other shapes. It has been described by John Barry in The Great Influenza as a "dandelion with a forest of two differently shaped protuberances- one roughly like a spike, the other roughly like a tree-jutting out from its surface." The protuberances are surface antigens. Antigens are what antibodies grab so that our bodies can fight invaders. The spike is Hemagglutinin (H) and the tree is Neuraminidase(N). There are 15 types of H and 9 types of N.

The job of H1 is to bind to sialic acid receptors on surface cells in the respiratory tract. There are a bunch of H1s that act like grappling hooks that "adsorb" the virus to the cell. Influenza A, unlike most other viruses, will let go of a cell if it can't attach properly and will attack another cell. With successful adsorption, a pit forms under the virus attachments, and the virus slips into the cell inside a little bubble. Once inside the cell, several steps take place, allowing the virus to penetrate the cell nucleus and make viral proteins that are packaged with new copies of viral genes.

While this is happening the N, which has a boxlike head and what looks like four identical six-bladed propellers, breaks up the sialic acid receptors on the cell membrane. After about ten hours the infected cell bursts. Because the sialic acid receptors are destroyed, the throng of 100,000 to 1 million virus particles won't stick to the burst cell and are free to swarm on other cells. Influenza, an RNA virus, mutates so rapidly that 99% of the new virus is too defective to infect another cell. That leaves 1,000 to 10,000 viruses with the ability to infect other cells.

With an effective immune response, those previously vaccinated or infected with a mild "dose" of the same or similar virus can have an effective rapid antibody response and clear the virus before it takes hold. The antibody must be able to recognize the surface antigen to attack it. Both the H and N surface antigens can mutate. They can mutate singly or together. When the mutations are large enough that there is a radical change in the shape of the surface antigens, antigen shift has occurred. This renders the surface antigen unrecognizable by the immune system. Mutation in surface antigens is one process by which viruses can infect multiple species. Pandemics generally result from antigenic shift.

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