

The West Nile Virus Infection: Like and Unlike the Poliovirus Infection

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Although human infections by the West Nile Virus (WNV) were first reported in Africa over 60 years ago, it is a new disease in North America. The first human case occurred in New York City in 1999. Within three years, the number has skyrocketed from 149 cases in 1999-2001 to over 3,000 cases in 2002 – a 20-fold increase. The virus now affects humans in more than 40 states in the US and almost every province in Canada.

the virus in a new ecological milieu or simply an increase in our awareness of the possible complications of WNV infection is not yet clear. However, the former possibility would not be surprising since the virus is not indigenous to the North American continent and there has been little time for native species to develop vigorous immunity to resist the infection.

Comparing poliovirus and West Nile Virus

To understand the potential implications of the WNV epidemic, it is useful to first briefly review several important features of the virus. *Unlike the poliovirus* that is a member of the picornavirus family, the WNV belongs to the family of flaviviruses. Also, unlike the poliovirus, for whom the human is the only natural host, mosquitoes are highly effective carriers of the WNV. Furthermore, mosquitoes along with several species of birds and mammals, such as horses, also help to harbor and multiply the WNV in large number, effectively acting as a reservoir to cause a greater number of human infections.

Like the poliovirus, the WNV also has a particular affinity for the central nervous system, especially the brain. Although most infected individuals may develop no more than a high fever and flu-like symptoms, some will go on to develop full-blown symptoms of encephalitis (infection of the brain) and even die. It is increasingly recognized that the WNV is also capable of causing severe paralysis by destroying motoneurons in the spinal cord – a role that is often associated with the poliovirus.

Avoid mosquito bites to avoid infection.

1. Apply insect repellent containing DEET (look for N,N-diethyl-metatoluamide) to exposed skin when you go outdoors. Even a short time being outdoors can be long enough to get a mosquito bite. -Centers for Disease Control and Prevention

Related Readings

Brinton, M.A. (2002). The molecular biology of West Nile virus: A new invader of the western hemisphere. *Annual Review of Microbiology*, 56, 371-402.

Leis, A.A., Stokic, D.S., Polk, J.L., Dostrow, V., & Winkelmann, M. (2002). A poliomyelitis-like syndrome from West Nile virus infection. *New Eng J Med*, 347, 1279-1280.

Campbell, G.L., Marfin, A.A., Lanciotti, R.S., & Gubler, D.J. *West Nile virus*. [Review] [90 refs]. *The Lancet Infectious Diseases* 2002, 2, 519-529.

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Not widely appreciated until recently, some of the insults due to WNV infection have an uncanny resemblance to that of poliomyelitis. This eerie resemblance poses a troubling specter: is it possible that a new wave of epidemics is coming?

The number of new cases of WNV infection will likely continue to climb steeply. The western states and provinces are still 'virgin' territories for the virus. Perhaps more worrisome is that the WNV has been more virulent in cases seen in North America. Besides infecting a far larger number of individuals than those epidemics reported in Africa, Europe, and Asia, the WNV also seems to cause more severe symptoms, more debilitating long-term consequences, and greater numbers of fatalities in North America. Whether this is due to a change in the behavior of

2. Clothing can help reduce mosquito bites. When possible, wear long sleeves, long pants, and socks when outdoors. Mosquitoes may bite through thin clothing, so spraying clothes with repellent containing permethrin or DEET will give extra protection. Don't apply repellents containing permethrin directly to skin. Do not spray repellent containing DEET on the skin under your clothing. -Centers for Disease Control and Prevention

What does the future hold?

Can we expect to see a flood of acute paralysis cases as a result of WNV infection in the coming years? Although nobody has a crystal ball, we believe that catastrophes, such as those seen during the polio epidemics in the 1950s, are probably unlikely to occur for two reasons. First, while the majority of individuals affected by the poliovirus were infants and young adults, those who become severely ill from contracting the WNV are mostly older individuals with co-existing illnesses, i.e., the vulnerable population is smaller. Second, science has come a long way since the 1950s and we are now in a better position to stem the spread of the infection. For example, a vaccine against the WNV has already been developed and the first field trials in susceptible animals have begun.

There are risks that this optimum scenario may not play out as expected. To minimize this possibility, two things will need to happen. First, considerable resources and coordinated efforts will be needed from all levels of government and health authorities to minimize the risks of exposure by vigorously controlling carriers and amplifying hosts, such as mosquitoes.

Second, as in the case of polio, the availability of an effective and safe vaccine will be a pivotal point. The delivery of a vaccine for human use from the time of development can be very lengthy. Since there is still no effective treatment once an individual has contracted the disease, this is not a luxury that we can afford.

Learning from the past

Lessons we have learned about post-polio syndrome over the past two decades may be instructive and applicable to some WNV survivors as well. The symptoms in post-polio syndrome, such as renewed muscle weakness, are related to over-fatiguing muscles affected by motor nerve loss from the poliovirus.

The same may also apply to WNV survivors and have important implications when setting rehabilitation goals and tailoring exercise programs for these individuals as they recover from the acute infection. Equally important is long-term advice regarding the appropriate types and intensity of physical exercise after the initial period of recovery. Based on observations made on many post-polio survivors, high intensity strength exercise is potentially damaging and should be avoided. In contrast, lower intensity but regular strengthening exercise programs are much more likely to be helpful. This is particularly true if the program incorporates cardiovascular fitness training as well.

Although WNV infection has many differences compared to poliomyelitis, there are also some striking similarities. Experience that has been gained from polio survivors could well be instructive when treating WNV. Prospectively following the long-term functional outcomes of the WNV survivors may yield further insights into the relationship of nerve and muscle function during physical activities and exercise training in persons with past viral infections. ●

3. Be aware of peak mosquito hours. The hours from dusk to dawn are peak mosquito biting times for many species of mosquitoes. Take extra care to use repellent and protective clothing during evening and early morning - or consider avoiding outdoor activities during these times.

-Centers for Disease Control and Prevention

Generally, products with about 30% DEET have proven the most effective in the long run.

-Consumer Reports