

SUMMARY
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Clinician Briefing
West Nile Virus and SARS
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WEST NILE VIRUS

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***Please note: Data and analysis discussed in these presentations were current when presented. Data collection and analysis are ongoing in many cases, therefore updates may be forthcoming elsewhere on this website, through publications such as [CDC's Morbidity and Mortality Weekly Report](#) or other venues. Presentations themselves will not be updated. Please bear this in mind when citing data from these presentations*

Characteristics of the 2003 Epidemic

- What we primarily saw in this year's West Nile epidemic was a western focus of the outbreak, and the most impacted states were Colorado, Nebraska, South Dakota, North Dakota, Texas, and Wyoming. This really indicated a shift from the Ohio and Mississippi River valleys, which were the concentration of activity in 2002, to the eastern approach to the Rockies in 2003.
- There was some activity on both sides of the Continental Divide, but the plains just before the Rockies is where we really saw the bulk of activity.
- The activity at this point in the season has trailed off significantly in most areas, although some states do continue to make a few case reports.
- California recently reported its second locally acquired case, and the state will most likely be continuing surveillance through the end of this year.
- As of yesterday, CDC is doing weekly updates of West Nile case numbers instead of daily updates. The total case count as of yesterday of human cases reported to CDC's ArboNet program was 7,718, with 166 human deaths.
- Case counts really started to pick up in July with close to 1,000 reported. There were nearly 4,800 cases reported in August and 1,700-odd cases reported in September. Numbers have been trailing off significantly during October.
- The median age of patients overall was 47 years with a range of one month to 99 years, but note that this is a combination of fever and meningoencephalitis cases.
- Fifty-three percent of cases were in males.
- Among the 166 fatalities, 78 were the median age (47 years), and 58% of those were male.

- The age range of fatalities reported as of this time is one month to 97 years.

Blood Donation

- Nationwide blood screening for West Nile virus was instituted in July of this year.
- At this point, a total of 707 presumptive West Nile viremic donors have been reported to the ArboNet program.
- Of the 532 donors for whom complete data was available, six subsequently developed meningoencephalitis, and 78 developed West Nile fever, indicating that the majority of donors remained asymptomatic and would not have been identified had it not been for blood screening.
- The manner in which reporting of positive presumptive viremic donors will continue in 2004 is yet undetermined, and that's because the testing that's being used will most likely no longer be under an IND. But many state health departments have found blood screening to be very helpful, and in some cases it detected human infections before other surveillance methods. So there is a great interest in having this continue.
- At this point in the year, blood donor screening is still continuing.

Acute Flaccid Paralysis

- CDC continues to collect data on West Nile polio-like acute flaccid paralysis as well other clinical syndromes that are not directly captured under the definition of meningitis or encephalitis.
- There are several different studies underway, primarily in Colorado where the highest intensity activity occurred, and one of these includes a retrospective study of more than 250 hospitalized patients to better document their clinical syndromes.
- Anecdotally, acute flaccid paralysis patients have tended to be in the age range of 30 to 60, so not necessarily quite as advanced in age as meningoencephalitis patients on the average, and they often seem to have lasting residual neurological effects. Their paralysis really does not necessarily seem to improve.
- There has been no evidence of a change in the virus over time in the United States, but reporting of acute flaccid paralysis has increased. This is most likely a reporting artifact, but this is something that we are paying attention to and will continue to document.

West Nile Infection in Pregnancy

- CDC is working with state and local health departments as well as individual physicians to follow up on cases of West Nile virus disease during pregnancy.
- Currently, CDC is following up more than 60 pregnancies across the United States and is looking to document the type of illness or effects that may occur in infants.

West Nile Infection Outside the United States

- West Nile activity has continued in Canada.
- There have been some case reports in Mexico; however, while some human illness has been reported, it is not yet completely well-documented.
- There are reports of two locally acquired cases in the Bahamas.
- There's a great deal of attention being paid to surveillance throughout the Americas, primarily North and Central America.

Imported Cases of West Nile Infection

- From a reporting or surveillance perspective, it has been increasingly difficult to localize the point of infections for potentially imported cases.
- Often states that have not reported a great deal of human activity have residents who have done a fair bit of traveling, and it has been much more difficult than previous years to identify where their potential exposure or infection may have occurred.

Differences Between the 2002 and 2003 Epidemics

- There have been some definite changes in the proportion of cases that have been reported as West Nile fever versus neuroinvasive disease.
- To date, of the current total cases, 29% were meningoencephalitis, 66% were West Nile fever, and 5% are currently unidentified.
- During 2002, the case totals were about 75% meningoencephalitis.
- The explanation of the shift in reporting is most likely the greater availability of commercial testing and that essentially many more people are being tested overall.
- There has been more intense surveillance for West Nile fever in many jurisdictions, which we can attribute to greater awareness of fever both among the public and clinicians.
- Although we do not have all the final numbers, it appears that the 2003 meningoencephalitis cases are likely to be approximately equal to the 2002 meningoencephalitis cases, the tally of which was 2,946 human cases.
- Anecdotally, we've had reports of West Nile fever illness being a longer lasting illness than was previously documented, with people having to take several weeks off work and in some cases reporting lasting fatigue and headaches. We should look for some published reports to be forthcoming in the next several months.
- This change in the severity of West Nile fever may indicate a need for those of us in both public health and clinical practice to shift away from labeling West Nile fever as a mild illness as this may be confusing for some members of the public.
- In some ways this change would enable us to have a more consistent prevention message for people of all ages, that while the risk of neuroinvasive disease is still highest for people over 50, it's important for people in younger age groups to use personal

prevention measures in order to avoid losing several weeks of work. Also, as I noted, there may be evidence of higher rates of acute flaccid paralysis.

Expectations for the 2004 Season

- We try to shy away from making predictions per se as you pretty much end up looking foolish when you do, but continued westward expansion of the virus is very much likely.
- It's not possible to make specific predictions in terms of where the local or focal points of activity might end up occurring, but certainly people have been looking to California and other states between the current western border of activity and the Pacific to see where activity may occur.
- It's important also to note that many areas in the East and the Midwest have continued to see activity. For example, states such as Pennsylvania, Minnesota, and Iowa each reported more than 100 human cases this past year. So while they were not necessarily the focal points of activity, they are still reporting a great deal of human illness, many of those neuroinfective cases.
- We don't know what will happen once the virus makes a trek of activity throughout the United States, whether or not we'll start seeing intensive activity back in the East or not. That remains a very interesting question.

SARS

Dr. John Jernigan

Co-Lead for the SARS Clinical and Infection Control Team

National Center of Infectious Disease

Overview

- In November of last year we began to see clusters of highly transmissible and severe atypical pneumonia among residents in Guangdong Province in China. Although it was not recognized as the earliest manifestations of the SARS outbreak at that time, in retrospect, that's in fact what was going on.
- We now know that SARS is caused by a novel coronavirus.
- The outbreak spread rapidly around the globe from Guangdong Province, resulting ultimately in over 8,000 cases from 32 different countries with a case fatality rate of between 10% and 15%.
- In July, the World Health Organization announced that all known person-to-person transmission of the SARS coronavirus infection had ceased. The cause for the decline in cases is not yet fully understood, but it's quite possible that SARS coronavirus may still exist within either an animal or a human reservoir and cause future outbreaks.
- Researchers in China have identified a coronavirus that is genetically closely related to the human SARS coronavirus in animals such as the masked palm civet cat and the raccoon dog.

- These viruses have been nearly identical to human isolates, and there have been reports of serial conversions in animal handlers in Chinese markets. This raises the possibility that there may have been prior transmission going on in these settings and raises the possibility that it might arise again.
- There's also some evidence in other human coronavirus infections that these viruses tend to be seasonal, to peak in the fall and winter and decline in the spring. It's possible that seasonality of the virus may have accounted for the decrease that we saw, and we may see a new wave coming in the new viral respiratory infection season.
- The bottom line is we need to be prepared for SARS to return.
- Toward that end, CDC has recently posted on our Web site a draft preparedness plan, and I'd like to review portions of that with you today.

Draft SARS Preparedness Plan: *Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS)*

- This draft plan has been developed not only through internal input, but with input from many external partners, including over 20 CDC partner societies representing public health, healthcare workers, and healthcare administration. We've gotten input through conference calls and face-to-face meetings here in Atlanta and elsewhere as well as written feedback.
- The key objectives of the plan center around rapid identification of SARS cases, early implementation of control measures, and efficient communication and cooperation among healthcare, the public health infrastructure, and also the public in general.
- The SARS plan comprises a core document that summarizes the overall preparedness strategy, and it has a series of supplements that go into more detail on exactly what preparedness recommendations are.
- Preparedness recommendations are divided into command and control issues, surveillance issues, issues associated with healthcare facilities, community and containment strategies, strategies to prevent transmission through international travel, issues relating to laboratory diagnosis, and also issues related to communication.
- The web page for the SARS preparedness plan, *Draft: Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS)*, is <http://www.cdc.gov/ncidod/sars/sarsprepplan.htm>.

SURVEILLANCE AND PREPAREDNESS IN HEALTHCARE FACILITIES

- Healthcare facilities and the healthcare setting played a very central role in the epidemiology of transmission of SARS.
- A disproportionate number of SARS cases occurred in healthcare workers, and when you include infections that were acquired by patients and visitors to healthcare facilities, more than 50% of cases actually were acquired in healthcare settings in some of the affected areas. This was true in Toronto and Singapore as well as Taiwan. So focusing efforts in healthcare facilities is key and is likely to be our greatest opportunity for surveillance for

early detection of cases, since some of the earliest cases will obviously present to healthcare.

- Early diagnosis and detection is a central theme in preventing any transmission in any future SARS outbreaks. Missed cases can lead to large outbreaks as we've seen. Again, healthcare facilities will play a crucial role in early surveillance, because this is where cases will be presenting.
- We probably have to take a graded approach to surveillance depending upon the level of SARS activity in the community and the world, and I'll talk a little more about that.
- Unfortunately, what we've learned so far about the clinical manifestations of SARS is that the disease is really very nondescript. Currently there are no specific clinical findings or routine laboratory findings that can distinguish with certainty SARS from other respiratory illnesses at the time of presentation.
- Early recognition, therefore, is going to depend upon the astute clinician who is able to combine not only the clinical data, but also the epidemiologic features of the illness in the patient that's presenting to them. So it's important for clinicians to be familiar with the important epidemiologic features of SARS.

EPIDEMIOLOGIC FEATURES OF SARS

- As we've learned more about the transmission of the illness, it's pretty clear that the vast majority of cases are acquired through close or direct contact with other patients who have SARS. That's fortunate in that it provides an opportunity to look for an epidemiologic link to SARS-affected areas or other persons with SARS and people who are presenting with an illness that may be clinically compatible with it.
- We know that SARS cases appear to occur in clusters, so the lack of clustering is a useful indicator and may be an argument against SARS.
- As I've mentioned, there is a tremendous association with healthcare, so clusters of unexplained pneumonia among healthcare workers or patients may be an important epidemiologic feature that should raise the suspicion of SARS.

USING EPIDEMIOLOGIC FEATURES FOR EARLY RECOGNITION

- When a patient comes in with an unexplained pneumonia or unexplained respiratory illness, we think that we're going to have to not only assess the clinical compatibility with SARS, but the risk of exposure to SARS, using some of the epidemiologic features mentioned above.
- The features you use are going to vary depending upon the level of SARS activity in the surrounding community and the world, whether there's no documented SARS transmission in the world, or whether there is documented SARS activity in the world.

EVALUATION FOR SARS IN THE ABSENCE OF DOCUMENTED TRANSMISSIONS

- For the status we are in now in which there have been no documented transmissions of SARS in the world recently, we think that the likelihood of having SARS approaches zero in patients presenting with respiratory illness.
- The exception would be the patient who has a very suggestive clinical presentation, that is, a severe, unexplained pneumonia in addition to some epidemiologic features suggesting the possibility of exposure to SARS. At this point, we're talking about travel to certain previously affected areas or some sort of evidence of clustering of unexplained pneumonias, which would include especially clusters among healthcare workers or in the healthcare setting.
- At this point, SARS should only be considered in patients who
 - are hospitalized for pneumonia of unknown etiology—we're using that as a marker for severe pneumonia, and
 - have at least one of the following
 - evidence of either recent travel to a previously SARS infected area or close contact with ill persons with a history of travel to such areas
 - are employed as a healthcare worker with recent patient contact
 - have had recent exposure to other persons in the community with unexplained pneumonia.
- At this point we consider previously SARS infected areas to be primarily Southeast Asia, which would be mainly China, Hong Kong, and Taiwan.
- If clinicians encounter such patients (e.g. hospitalized with pneumonia AND have one of the risk factors above), they should notify the local health department.
- We're recommending that clinicians use droplet precautions in the care of such patients. That's basically the use of a simple surgical or isolation mask in the care of those patients, and I'll talk about the rationale for that in a moment.
- Don't forget to consider other common causes of community acquired pneumonia, because that's still what it's likely to be.
- Perform a clinical workup that attempts to identify alternative pathogens, because that's one of the better ways to rule out SARS.
- After discussing the patient with the health department, if there are no alternative etiologies that come to fore, if there is on further investigation some reason to believe that there is clustering, and if it is a worrisome scenario, then at that point, testing for SARS might be considered.
- We're not recommending testing for SARS except in the setting of consulting with the local health department. The reason for this is that although the PCR test, which is the test that is most widely available at the moment, is pretty specific, we've seen problems with non-specificity and lab contamination, etc.
- With the prevalence of SARS and the likelihood of SARS being so low at this point, the positive predictive value of those tests is likely to be very low.
- Calculations at the moment are that the positive predictive value of a positive PCR test in this setting is likely to be less than 10%. So in other words, most positive PCR tests right

now are likely to be false positives, and they will set off great concern, both from a public health standpoint and probably result in a lot of wasted resources.

- We need to be very judicious in testing for SARS, and we encourage clinicians not to just say, “Oh well, I’ll send a SARS test just to be sure.” There should be pretty firm epidemiologic evidence for SARS before that test is performed.

EVALUATION FOR SARS IN THE PRESENCE OF DOCUMENTED TRANSMISSIONS

- If we do see a resurgence of SARS, evaluating patients will be a bit different, and for certain groups, we’re going to have a lower threshold for suspicion.
- The likelihood that a patient presenting with respiratory symptoms might have SARS is going to vary depending upon their exposure to settings with current SARS activity. If they don’t have a history of such exposure, the risk is going to be very low. Therefore, there should be a pretty high threshold for clinical suspicion, and we’d use the same criteria that I’ve just gone over: suspect patients are those who are hospitalized for pneumonia and who have traveled to a previously SARS infected area or have been where there is evidence of clustering either in the healthcare setting or in the community.
- If there has been a recent exposure to settings in which there is documented SARS activity, such as travel to a SARS affected area or exposure to another person suspected of having SARS, the risk is going to be significantly higher. Therefore, we should have a lower threshold for clinical suspicion in these patients. We would be concerned about fever or respiratory illness even in the absence of pneumonia in such a setting.
- To review, after SARS transmission has been documented anywhere in the world, and we’re not at that stage yet, SARS should be considered among patients with:
 - early clinical features that might be compatible with SARS, and this would include either fever or respiratory symptoms PLUS
 - evidence suggesting potential exposure to SARS coronavirus, either by exposure to areas currently infected by SARS or close contact to a suspected SARS case
- If that’s the case, then we recommend that the clinician:
 - isolate the patient using SARS isolation precautions, and I’ll talk about those in a minute
 - notify the health department
 - start a diagnostic workup
 - probably test for SARS

PATIENT MANAGEMENT ALGORITHM FOR SARS

- The draft SARS preparedness plan includes an algorithm for working through patients who are suspected of having SARS, and it gives the opportunity to rule out the diagnosis as best we can. That may be difficult to do, because the sensitivity of PCR may be low in some patients, and the only way to absolutely rule SARS out via the laboratories is by waiting for a convalescent serology, which can take up to four weeks. So there are clues

in the clinical progression that would help argue against SARS, and this algorithm sort of walks through those issues.

INFECTION CONTROL

- The preparedness plan includes guidance for infection control.
- We think the probable mode of transmission for SARS is through large droplet aerosolization. This means droplets that are not transmitted over large distances through the air. You have to have close contact to a patient or direct contact to contract the disease in this way.
- There have been certain cases and certain clusters of illness in which airborne transmission can't be ruled out, particularly around aerosol generating medical procedures that involve aerosolization of respiratory secretions. There is a lot to be learned about this, and airborne transmission has not been absolutely documented.
- At this point, because there is some uncertainty and because there may be a minor component of airborne transmission in these settings, CDC is still recommending caring for suspected SARS patients under both contact precautions and airborne precautions. This involves wearing a respirator, N95 or higher, and caring for the patient in a negative pressure room if possible.
- We also are recommending eye protection. This, again, is a conservative measure based upon the observation in some other viral illnesses where disease is efficiently transmitted by contact between the healthcare worker's contaminated hand and the conjunctiva. We don't know that that happens in SARS, but based upon the high attack rate in healthcare workers and the potential severity of the illness, we are recommending eye protection at this time.

OTHER ISSUES ADDRESSED IN THE PREPAREDNESS PLAN

- Details of patient isolation and several options there, particularly for a setting in which there are a limited number of negative-pressure rooms
- Engineering controls that may be considered to prevent SARS transmission
- How to evaluate healthcare workers who may have been exposed to SARS and how to manage them
- The importance of preparedness planning for staffing needs during the setting of an outbreak
- Suggestions for personnel policies
- Suggestions for access controls, that is, eliminating visitations to hospitals during various levels of SARS activity
- Suggestions for planning for shortages in supplies and equipment
- Suggestions regarding communication among facilities, clinicians, public health agencies, and the public

Soliciting Input to SARS Preparedness Plan

- I want to encourage you all to review the plan. There is a lot of information there. I will emphasize that it is still currently a draft plan. We are viewing this as a living document, and as more information and as more input and suggestions become available, we will update the document as needed.
- If you look at the plan and have comments on how it can be improved, we are anxious to get that feedback and work with you to make this as valuable as it can be for everyone involved.

Conclusion

- A resurgence of SARS could pose major challenges to healthcare facilities and staff.
- We need to start now by developing plans to manage SARS and other infectious diseases in advance, should they emerge
- Healthcare facilities everywhere should be prepared to move swiftly and boldly to implement aggressive control measures should we see resurgence of this illness.

QUESTIONS AND ANSWERS

Dr. Mark Russi

American College of Occupational and Environmental Medicine

This is a question for Dr. Jernigan, and it regards when you expect that the Appendix C2 of the SARS document will be completed or at least when there will be a draft form available, the one addressing personal protective equipment and infection control in hospitals.

Dr. Jernigan

That's the consolidated infection control documents. We're working on that now, and we hope to have it in the next update of the preparedness plan, which we hope is going to happen soon. So look for it soon.

Dr. L. J. Tan.

American Medical Association

This is for Dr. Jernigan. Just a quick question on your previously SARS infected areas in your documents. It's not defined yet, but you just said China, Taiwan, and Hong Kong. Is that what you're going to be defining as the previously SARS infected areas for the algorithm?

Dr. Jernigan

There are several lines of evidence that would lead one to be more suspicious of Southeast Asia in general as a region in which SARS could recur, if in fact it does. But more specifically, we think the higher risk areas are China, Hong Kong, and Taiwan. So there will be a little bit of wiggle room there. I mean if you have somebody from somewhere else in Southeast Asia that has very typical and very concerning epidemiologic findings, of course we might consider that. But those are going to be the key areas and what we think are going to be the high-risk exposure areas.

Dr. Peggy Neill
Infectious Diseases Society of America

To shift it a bit, a question for Emily. Are you able to give us a similar, very nice summary at the level of our mosquito and animal surveillance studies and compare and contrast in terms of 2002 versus 2003 for West Nile?

Dr. Gutierrez

Sure. Let me see what I have. I know we don't have as detailed quantification for this year. I've got the total number of birds that were reported, that were included in any reports to CDC at this point: 10,783. I definitely have to make the caveat that in a lot of regions, people have become a bit fatigued with dead bird reporting, particularly in the East, and there are great variations with the way local jurisdictions actually are able to either collect or process those birds. So I can't make a whole lot of comparisons to last year.

I'm looking at what there is. I think, certainly, the overall number of equine cases that have been reported to CDC is lower than during 2002, and one might attribute that to, in large part, more widespread use of the equine vaccine. We did have a number of additional species reported this year. Of about 3,500 total veterinary cases that have been reported, there are 14 squirrels, 25 other species including things like alligators, which are getting a lot of attention, alpaca, and mule deer. Really a lot of different mammal species can become infected. Very few of them do seem to develop clinical disease. There were a handful of domestic dogs and cats that were infected and reported. But for the most part, healthy domestic dogs and cats do not become ill.

The big news in terms of mosquito collection is that we are up to, I want to say, 37 mosquito species that have been found to be infected either in the wild or in the laboratory. The main driving species for most of the outbreaks last year was *culex quinquefasciatus*, especially in Louisiana. What we saw this year was *culex tarsalis*, which behaves very differently. This has to be taken into account in some of the control measures that are used, because it does have a long flight distance. For example, here in Colorado there was a need to control *culex tarsalis* both in urban areas as well as in peripheral areas that have extensive irrigation, because it is a mosquito species that will breed in irrigation canals. As we move out West in areas that people have typically seen as being very dry, the public often has been surprised that they can harbor mosquito species, and so they maybe are not always accustomed to protecting themselves. But where irrigated land is predominant, *culex tarsalis* will continue to be a key species, and that's

really what we saw in the record levels of *tarsalis* infestations in Colorado this year, probably at higher levels than they had seen in any time that they've been record-keeping.

I know that doesn't necessarily give you the comparison with 2002, but those are some of the highlights.

Dr. Neill

Can I ask another question related to that? I realize this is a qualitative type of an assessment. Are we still on the same page then that surveillance in the equines will not help us in terms of advanced prediction for human disease? Then I've seen an awful lot that seems to be seesawing back and forth on what form of surveillance laboratory, what species, etc., and frequency. Is there anything that's being teased out at this point that is looking suggestive for an efficient form of surveillance to predict the occurrence of subsequent human disease?

Dr. Gutierrez

There has been some, and there is a lot of effort going on now to analyze data from earlier this season looking at the western environment to see what was predictive. There have been in individual cases, and I think I'm recalling Florida, but it may have been elsewhere as well, that the first case seen was veterinary. But as you noted with the increasing use of the equine vaccine, we're probably not going to see those being the leading edge of cases.

In a fairly recent publication in EIB, a couple of months ago now, there was a description of the fact that early season dead bird reporting and prompt testing and identification can be predictive of human activity. The mosquito pool data are being analyzed now, at the least for the level of infestation that was seen in some of the counties that ended up having the highest human rates. Looking at these data would have prompted people to say, "Oh, retrospectively, we should have realized that this meant we were going to have a record season in this area," which some people realized, but there weren't necessarily enough data to tell them what that meant they needed to do in terms of control measures.

So I think there is still a lot of interest in using dead birds as a sentinel measure. The first indications that local activity was occurring in California were both a positive mosquito pool and sentinel bird activity in Imperial County in the southern part of the state. So I'm not sure that everyone would be in agreement still about which are going to be the most important species. The attention to veterinary cases will continue just because those are of interest in and of themselves, though their predictive value is decreasing. And I think we're really looking to see whether or not in the western environment we would see anything different than we did in the East.