New Wave of Transmitted Drug Resistance Predicted for San Francisco

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The number of new HIV infections with virus resistant to HIV drugs known as non-nucleoside reverse transcriptase inhibitors (NNRTIs) could rise significantly in San Francisco and become a self-sustaining epidemic, according to a study published online January 14 in the journal *Science* and reported by Bloomberg News. The authors also fear that an upswing in transmitted drug-resistant virus could imperil efforts to test and treat nearly everyone living with HIV in developing countries.

Transmitted drug resistance (TDR) is an ever-present concern for scientists, physicians and people with HIV. When people with drug-resistant HIV pass their virus to others, those newly infected people have fewer treatment options.

Thus far, TDR has remained fairly stable at about 14 percent or less of new infections in many Western countries. About 75 percent of TDR HIV cases in San Francisco involve virus resistant to NNRTIs, such as Sustiva (efavirenz) and Viramune (nevirapine).

To determine whether TDR is likely to remain stable or to grow in San Francisco, a group of biomedical mathematicians led by Sally Blower, PhD, from the University of California in Los Angeles, devised a mathematical model of TDR. This model took into account current trends, as well as the likely infectiousness of different strains of drug-resistant virus.

Blower's team found that although most TDR strains are not likely to rise significantly, there is lingering concern with transmitted NNRTI-resistant strains. "If only 70 percent [of people on NNRTIs] are virally suppressed, NNRTI-resistance could increase by more than 30 percent," Blower explained.

"Our results have shown that effective treatments have prevented TDR from increasing to greater than 15 percent in San Francisco," she continued. "However, our modeling shows the network is continuing to evolve. Disturbingly, we found the majority of the resistant strains currently being transmitted in this city are capable of causing self-sustaining epidemics.... We predict a wave of NNRTI-resistant strains will emerge over the next five years in San Francisco due to transmission from untreated individuals."

The model also has Blower and her colleagues fearing that the potential wave of new TDR in San

Francisco could have dire implications for the developing world—where the choice of second-line regimens is extremely limited. Blower explained that resistance is most likely to develop against NNRTIs, compared with other current HIV drugs, and that NNRTIs are used almost universally as first-line treatment in the developing world.

Some experts have proposed a massive “test and treat” campaign to test most people for HIV and provide ARV treatment as a way to increase survival among people with HIV and prevent new infections.

Blower, however, cautions against this approach. “Universal test and treat is just a recipe for disaster,” she told Bloomberg News. “Our modeling is saying the drug resistant strains that you will generate from this kind of strategy are ones that will be very strong, transmissible, and therefore you will get an awful lot of problems.”
