
News

Mahmoud seminar grapples with infectious disease, global health threats



Nations can act on policy options to mitigate against major infectious disease pandemics, Mahmoud told students in his seminar.

By Pat Olsen

On a recent Wednesday evening, Dr. Adel Mahmoud, a lecturer with the rank of professor in the Woodrow Wilson School and Princeton's Department of Molecular Biology, led a session for the graduate course he teaches this semester, *WWS 571c: Challenges of Infection, Burden and Control*. This session was intended to explore various countries' experiences with influenza and malaria. Mahmoud also addressed the biology of these diseases, the challenges they present, and strategies for controlling their spread, if not their eradication.

Mahmoud is an expert on disease control in the developing world as well as a former president of Merck Vaccines, and the course has attracted students from a variety of disciplines: for example, Lauren Stein is a research specialist with the Princeton Neuroscience Institute. Audrey Dorelien, a second-year doctoral student from Haiti, is pursuing a Ph.D. focusing on demography at the Woodrow Wilson School. "My particular area of interest is how land use patterns increase the spread of infectious diseases and what can be done to reduce the risk, so this class is particularly relevant," Dorelien said. "Dr. Mahmoud makes us think outside the box."

“Policymakers have significant concerns regarding influenza and malaria,” Mahmoud said as he introduced the evening’s topics. “Influenza is not innocuous as some might believe. Arriving each fall in the northern hemisphere and each spring in the southern hemisphere, it results in 20,000 to 30,000 deaths annually in the U.S alone. It is a serious public health issue.”

Elderly flu victims account for most of the deaths, probably as a result of secondary infection such as pneumococcal pneumonia, he told the students. Influenza is linked to toxicity to the heart and respiratory system, and a lowered immune response that makes sufferers more susceptible. Ideally, seasonal vaccinations should contain the spread, but penetration is no more than 60% of the population in the U.S., and many countries lack a vaccination program.

“The influenza virus is classified according to its two surface molecules, hemagglutinin (HA) and neuraminidase (NA), and most of the antibodies produced by the vaccine when administered to humans are against the HA molecule,” explained Mahmoud. A new vaccine must be produced annually because of the propensity of the HA molecule to change every year.

The possibility of a flu pandemic like the H1N1 virus that killed between 20 to 50 million people globally in 1918 also concerns policy makers. Students peppered Mahmoud with questions about the possibility of flu epidemics in the U.S. He offered a number of suggestions for trying to avoid such a pandemic: countries can increase global surveillance; educate citizens about the need for annual vaccinations; continue research on both influenza and pandemics; stockpile antiviral medication and vaccines; and work to coordinate animal and public health.

Currently, health professionals are closely watching avian flu, the H5N1 virus, responsible for several hundred human deaths in Asia and a lesser number in Europe and Africa. “The way in which people live so closely with animals and birds in the affected countries helps to explain the ecological reason for the spread of infection,” Mahmoud suggested, but no one knows with any certainty if the bird flu will reach pandemic proportions. Scientists are divided about how difficult it might be for the virus to mutate and pass from human to human.

Class discussion then focused on malaria, a mosquito-borne illness caused by a parasite. Malaria is found throughout the developing world, but is most prevalent in

sub-Saharan Africa. "This disease was endemic in the southeastern U.S. at one time, but was eradicated in this country thanks to chloroquine and DDT," Mahmoud said. Artemisinin, an extract of a plant from China, is the latest medication for combating the illness, and unlike the case with chloroquine, the parasite has not yet developed a resistance to it.

In the mid-1950s the World Health Organization announced a global program to eradicate the disease through the use of chloroquine and the insecticide DDT, but the program was abandoned in the early 1970s for several reasons. Parasites developed resistance to the medication, mosquitoes became resistant to DDT, and there was public outcry about the insecticide's toxicity and risk to the environment.

Drawing on his wealth of knowledge, Mahmoud offered two additional facts about malaria. Some residents living in areas with a high incidence of the disease can actually develop a degree of immunity, but if they leave the area they lose it and must take prophylactic measures upon their return.

"Several organizations are working on vaccines for malaria," Mahmoud said, "but they must surmount the technical complexity involved in producing one that is effective on a complex parasite." Whether or not this is possible remains to be seen. Current management involves the use of chemotherapy, bed nets, and insecticides. Environmental changes, such as reducing standing water or covering it, can reduce mosquito breeding.