Opportunistic infections occur with greater frequency or severity in patients with impaired host defenses. Growing numbers of HIV-infected persons, transplant recipients, and elderly persons are at increased risk.

Alison Grant, London School of Hygiene and Tropical Medicine, discussed opportunistic infections due to HIV. In 1997, more than 30 million HIV-infected persons lived in the world, with more than two thirds of them in sub-Saharan Africa and an additional 20% in Asia and Latin America. Assessments of the prevalence and incidence of opportunistic infections in these areas and comparability of the available data are hampered by limited access to care, diagnostic capabilities, and surveillance data. Despite these limitations, we know that tuberculosis (TB) is the most frequent serious opportunistic infection in the developing world. Other such infections common in sub-Saharan Africa include septicaemia (of which nontyphoid salmonella is the most common cause), toxoplasmosis, and bacterial pneumonia. *Pneumocystis carinii* infection, for unknown reasons, is uncommon among adults in East and West Africa but appears to be more common in South Africa. *Penicillium marneffei* infection, common in Thailand, is an example of an opportunistic infection of importance in a specific region; risk factors in these regions are largely unknown. Additional challenges are posed by the different HIV subtypes in the developing world and the possibility that some may be associated with a differential risk for opportunistic infections. Prevention efforts in developing countries have been limited. More work is needed to evaluate prophylactic regimens appropriate to different regions. Prevention of TB with isoniazid; of pneumocystosis, toxoplasmosis, and some bacterial infections with cotrimoxazole; and of pneumococcal infections with 23-valent pneumococcal vaccine have potential.

Robert Hogg, University of British Columbia, discussed the remarkable changes in the natural history of HIV in North America, specifically in British Columbia, as a result of highly active antiretroviral therapy (HAART). Of more than 5,000 HIV-infected persons receiving care in British Columbia, more than 2,000 are receiving HAART. HIV viral loads have been reduced to undetectable levels in approximately half of these patients, with corresponding decreases in the incidence of opportunistic infections, hospitalizations, and deaths. However, even for persons who have access to the therapy, these successes may be short-lived as resistance to HAART becomes more widespread. HAART use has resulted in new syndromes that may occur soon after therapy, probably representing preexisting, subclinical infections that are unmasked by the immunologic improvement that accompanies HAART; these syndromes include lymphadenitis associated with *Mycobacterium avium* complex, cytomegalovirus retinitis, and miliary TB on chest X-ray. Hepatitis C infection, common in HIV-infected injection drug users, may pose increasing problems as coinfected persons live longer. Therefore, surveillance for old and new syndromes remains critical even with the reduced incidence of opportunistic infections that has been associated with HAART.

Robert Rubin, Harvard University and Massachusetts Institute of Technology, discussed opportunistic infections in hematopoietic stem cell (bone marrow) and solid-organ transplant recipients; the number of these transplant recipients has increased dramatically in the United States in the past decade. The opportunistic infections in these patients originate from endogenous flora (e.g, invasive candidiasis), from the general (nonhospital) environment (e.g,
histoplasmosis, TB, disseminated strongyloidi-
asis), or from the hospital environment (e.g.,
aspergillosis, legionellosis, and infections with
vancomycin-resistant enterococci or multiply
resistant gram-negative bacteria). These infec-
tions characteristically occur in a time-depen-
dent pattern posttransplant, corresponding with
the nature of the immunodeficiency. For
example, in bone marrow transplant recipients,
infections within 1 month of transplantation
(pre-engraftment) occur as a result of neutrope-
nia and disruption of mucosal surfaces; infections
that occur in the second or third months are due
to deficiencies in cell-mediated immunity and are
more frequent in the setting of graft versus host
disease. In solid-organ transplant recipients,
infections within the first month are generally
associated with technical problems related to
surgery; infections that occur later are due to
immunodeficiency associated with immunosup-
pressive therapy. These timetables are useful in
that infections that are unusual or occur outside
the expected time frame may serve as sentinels
for emerging opportunistic infections. Research
priorities in this area include development of
therapies that will enhance successful transplan-
tation without increasing the risk for opportunis-
tic infections, strategies to reduce the risk of
drug-resistant opportunistic infections, and
greater understanding of the role of cytokines in
the relationship between graft versus host
disease and opportunistic infections.

Carol Kauffman, University of Michigan and
the Ann Arbor Veterans Administration Medical
Center, discussed infections in the elderly, a
population that is increasing in the United
States and worldwide. Persons \(\geq 65\) years of age
already constitute approximately one eighth of
the U.S. population; this proportion is expected
to double in the next 50 years. Elderly persons
have defects in T-cell immunity that result in
increased incidence and death from TB. B-cell
defects result in increased susceptibility to
*Streptococcus pneumoniae* and respiratory
syncytial virus and a decreased response to 23-
valent pneumococcal vaccine. Elderly persons
are at increased risk for cancer, so various
treatments associated with immunosuppres-
sion (such as organ transplantation and
aggressive cancer chemotherapy) are increas-
ingly being used in this population. Chronic
corticosteroid therapy is frequently used for
treatment of temporal arteritis. Although HIV
infection is relatively uncommon in the elderly,
when it does occur, it is likely to go undiagnosed.
Because of higher rates of hospitalization, elderly
persons are more susceptible to nosocomial
infections (including those caused by antibiotic-
resistant organisms). Moreover, the elderly are
more likely to reside in long-term care facilities,
which may serve as sources or amplifiers of
infections such as influenza. Susceptibility to
infection may be further increased by malnutri-
tion, diabetes, and chronic renal failure. Finally,
healthy, more affluent older persons are at risk
for infections associated with travel.

In summary, opportunistic infections are a
threat in the increasing populations of
immunocompromised persons. In these popula-
tions, opportunistic infections pose challenges for
surveillance and determination of risk factors,
including those for infection with antibiotic-
resistant organisms.