therapy of choice is sulfamethoxazole-trimethoprim. However, significant adverse effects, including leukopenia, nausea, vomiting, and elevation of liver transaminase levels, are associated with this therapy. Intravenous pentamidine is a reasonable alternative to sulfamethoxazole-trimethoprim, but this therapy may be complicated by hypoglycemia. Less toxic drug regimens are available (e.g., trimethoprim and dapsone, clindamycin and primaquine), but they are recommended only after failure of other medications. Corticosteroids should be considered in patients with severe disease as demonstrated by significant hypoxemia (e.g., Pao_2 <70 mm Hg). Corticosteroids decrease the likelihood of progression to respiratory failure.

For a deeper discussion on this topic, please see Chapter 341, "Pneumocystis Pneumonia," in Goldman-Cecil Medicine, *25th Edition.*

PROSPECTUS FOR THE FUTURE

Lung infections cause high morbidity and mortality rates in the community and in health care settings. A significant portion of these infections affects the extremes of age—young children and older adults. The judicious use of antimicrobial agents helps to prevent emergence of drug resistance. Continued efforts are needed to reinforce vaccination against infectious agents, including influenza and *S. pneumoniae*.

Co-infection with HIV and TB are significant problems in Africa, where effective HIV therapy is less available. This was highlighted by the identification of extensively drug-resistant TB (XDR-TB), which is caused by a strain of *M. tuberculosis* that is resistant to many available antimycobacterial agents and is difficult to cure. The potential adverse effects of vaccinations are another area of concern.

New and devastating epidemic infections continue to be recognized. Examples include MERS-CoV and severe acute respiratory syndrome (SARS), a rapidly progressive respiratory illness identified in the Guangdong province of China, Hong Kong, Vietnam, Singapore, and Canada.

There have been four influenza pandemics during the past century, each caused by a novel influenza virus and recently caused by viruses containing components of previous human and avian influenza viruses. Estimates of potential global mortality related to pandemic avian influenza are as high as 62 million deaths, and there is no specific treatment available. In 2009, the H1N1 ("swine") influenza virus emerged in Mexico. It has spread worldwide and has been designated a pandemic by the WHO. At least initially, H1N1 had a relatively low mortality rate, but it may mutate to produce more severe disease in humans. The most recent outbreak of avian influenza A H7N9 in 2013 was limited to China, and most infected patients reported contact with poultry with no evidence of sustained human-to-human transmission.

PCR assay of 16S rRNA genes may provide species-specific signature sequences useful for bacteria identification. The dysbiosis hypothesis states that alterations to microbial communities in terms of structure and stability may result in human disease. Pertinent to the lung, which was previously thought to be sterile, 16S rRNA gene sequencing provides a glimpse into the normal respiratory microbiome. Based on changes in these normal microbial communities, the cause, identification, and management of various diseases may be inferred.

SUGGESTED READINGS

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