patients and experimental animal models indicates that cell-mediated immunity is an important mechanism of host defense against HRSV. Evidence suggests that major histocompatibility class I–restricted cytotoxic T cells may be particularly important in this regard.

CLINICAL MANIFESTATIONS

HRSV infection leads to a wide spectrum of respiratory illnesses. In infants, 25–40% of infections result in lower respiratory tract involvement, including pneumonia, bronchiolitis, and tracheobronchitis. In this age group, illness begins most frequently with rhinorrhea, low-grade fever, and mild systemic symptoms, often accompanied by cough and wheezing. Most patients recover gradually over 1–2 weeks. In more severe illness, tachypnea and dyspnea develop, and eventually frank hypoxia, cyanosis, and apnea can ensue. Physical examination may reveal diffuse wheezing, rhonchi, and rales. Chest radiography shows hyperexpansion, peribronchial thickening, and variable infiltrates ranging from diffuse interstitial infiltrates to segmental or lobar consolidation. Illness may be particularly severe in children born prematurely and in those with congenital cardiac disease, bronchopulmonary dysplasia, nephrotic syndrome, or immunosuppression. One study documented a 37% mortality rate among infants with HRSV pneumonia and congenital cardiac disease.

In adults, the most common symptoms of HRSV infection are those of the common cold, with rhinorrhea, sore throat, and cough. Illness is occasionally associated with moderate systemic symptoms such as malaise, headache, and fever. HRSV has also been reported to cause lower respiratory tract disease with fever in adults, including severe pneumonia in the elderly—particularly in nursing-home residents, among whom its impact can rival that of influenza. HRSV pneumonia can be a significant cause of morbidity and death among patients undergoing stem cell and solid organ transplantation, in whom case–fatality rates of 20–80% have been reported. Sinusitis, otitis media, and worsening of chronic obstructive and reactive airway disease have also been associated with HRSV infection.

LABORATORY FINDINGS AND DIAGNOSIS

The diagnosis of HRSV infection can be suspected on the basis of a suggestive epidemiologic setting—that is, severe illness among infants during an outbreak of HRSV in the community. Infections in older children and adults cannot be differentiated with certainty from those caused by other respiratory viruses. The specific diagnosis is established by detection of HRSV in respiratory secretions, such as sputum, throat swabs, or nasopharyngeal washes. Virus can be isolated in tissue culture, but this method has been largely supplanted by rapid viral diagnostic techniques consisting of immunofluorescence or ELISA of nasopharyngeal washes, aspirates, and (less satisfactorily) nasopharyngeal swabs. With specimens from children, these techniques have sensitivities and specificities of 80–95%; they are somewhat less sensitive with specimens from adults. RT-PCR detection techniques have shown even higher rates of sensitivity and specificity, particularly in adults. Serologic diagnosis may be made by comparison of acute- and convalescent-phase serum specimens by ELISA or by neutralization or complement-fixation tests. These tests may be useful in older children and adults but are less sensitive in children <4 months of age.

TREATMENT HUMAN RESPIRATORY SYNCYTIAL VIRUS INFECTIONS

Treatment of upper respiratory tract HRSV infection is aimed primarily at the alleviation of symptoms and is similar to that for other viral infections of the upper respiratory tract. For lower respiratory tract infections, respiratory therapy, including hydration, suctioning of secretions, and administration of humidified oxygen and antibronchospastic agents, is given as needed. In severe hypoxia, intubation and ventilatory assistance may be required. Studies of infants with HRSV infection who were given aerosolized ribavirin, a nucleoside analogue active in vitro against HRSV, demonstrated a modest beneficial effect on the resolution of lower respiratory tract illness, including alleviation of blood-gas abnormalities, in some studies. The American Academy of Pediatrics does not recommend routine use of ribavirin but states that treatment with aerosolized ribavirin "may be considered" for infants who are severely ill or who are at high risk for complications of HRSV infection; included are premature infants and those with bronchopulmonary dysplasia, congenital heart disease, or immunosuppression. The efficacy of ribavirin against HRSV pneumonia in older children and adults, including those with immunosuppression, has not been established. No benefit has been found in the treatment of HRSV pneumonia with standard immunoglobulin; immunoglobulin with high titers of antibody to HRSV (RSVIg), which is no longer available; or chimeric mouse–human monoclonal IgG antibody to HRSV (palivizumab). Combined therapy with aerosolized ribavirin and palivizumab is being evaluated in immunosuppressed patients with HRSV pneumonia.

PREVENTION

Monthly administration of RSVIg (no longer available) or palivizumab has been approved as prophylaxis against HRSV for children <2 years of age who have bronchopulmonary dysplasia or cyanotic heart disease or who were born prematurely. Considerable interest exists in the development of vaccines against HRSV. Inactivated whole-virus vaccines have been ineffective; in one study, they actually potentiated disease in infants. Other approaches include immunization with purified F and G surface glycoproteins of HRSV or generation of stable live attenuated virus vaccines. In settings where rates of transmission are high (e.g., pediatric wards), barrier methods for the protection of hands and conjunctivae may be useful in reducing the spread of virus.

HUMAN METAPNEUMOVIRUS INFECTIONS

ETIOLOGIC AGENT

Human metapneumovirus (HMPV) is a viral respiratory pathogen that has been assigned to the Paramyxoviridae family (genus *Metapneumovirus*). Its morphology and genomic organization are similar to those of avian metapneumoviruses, which are recognized respiratory pathogens of turkeys. HMPV particles may be spherical, filamentous, or pleomorphic in shape and measure 150–600 nm in diameter. Particles contain 15-nm projections from the surface that are similar in appearance to those of other Paramyxoviridae. The single-stranded RNA genome codes for nine proteins that, except for the absence of nonstructural proteins, generally correspond to those of HRSV. HMPV is of only one antigenic type; two closely related genotypes (A and B), four subgroups, and two sublineages have been described.

EPIDEMIOLOGY

HMPV infections are worldwide in distribution, are most frequent during the winter in temperate climates, and occur early in life, so that serum antibodies to the virus are present in 50% of children by age 2 and in nearly all children by age 5. HMPV infections have been detected in older age groups, including elderly adults, and in both immunocompetent and immunosuppressed hosts. This virus accounts for 1–5% of childhood upper respiratory tract infections and for 10–15% of respiratory tract illnesses requiring hospitalization of children. In addition, HMPV causes 2–4% of acute respiratory illnesses in ambulatory adults and elderly patients. HMPV has been detected in a few cases of SARS, but its role (if any) in these illnesses has not been established.

CLINICAL MANIFESTATIONS

The spectrum of clinical illnesses associated with HMPV is similar to that associated with HRSV and includes both upper and lower respiratory tract illnesses, such as bronchiolitis, croup, and pneumonia. Reinfection with HMPV is common among older children and adults and has manifestations ranging from subclinical infections to common cold syndromes and occasionally pneumonia, which is seen primarily in elderly patients and those with cardiopulmonary diseases. Serious HMPV infections occur in