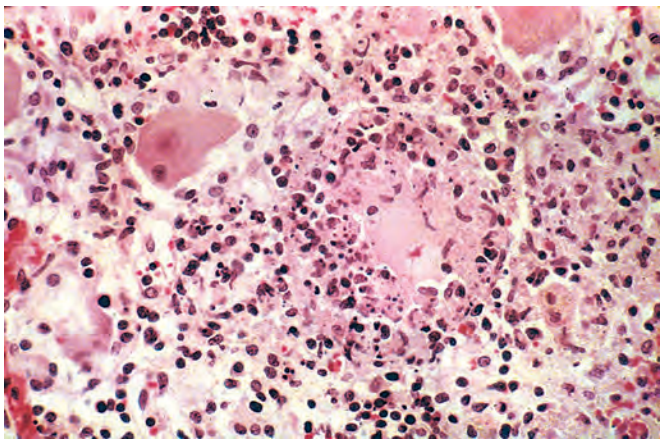

Figure 8-11 Dorsal root ganglion with varicella-zoster virus infection. Note the ganglion cell necrosis and associated inflammation. (Courtesy Dr. James Morris, Radcliffe Infirmary, Oxford, England.)

more dermatomes. There, the virus infects keratinocytes and causes vesicular lesions, which, unlike chickenpox, are often associated with intense itching, burning, or sharp pain because of concomitant radiculoneuritis. This pain is especially severe when the trigeminal nerves are involved; rarely, the geniculate nucleus is involved, causing facial paralysis (Ramsay Hunt syndrome). The sensory ganglia contain a dense, predominantly mononuclear infiltrate, with herpetic intranuclear inclusions within neurons and their supporting cells (Fig. 8-11). VZV can also cause interstitial pneumonia, encephalitis, transverse myelitis, and necrotizing visceral lesions, particularly in immunosuppressed people.

Cytomegalovirus

Cytomegalovirus (CMV), a β-group herpesvirus, can produce a variety of disease manifestations, depending on the age of the host, and, more importantly, on the host's immune status. CMV latently infects monocytes and their bone marrow progenitors and can be reactivated when cellular immunity is depressed. CMV causes an asymptomatic or mononucleosis-like infection in healthy individuals but devastating systemic infections in neonates and in immunocompromised people, in whom the virus may infect many different cell types and tissues. As its name implies, CMV-infected cells exhibit gigantism of both the entire cell and its nucleus, which typically contains a large inclusion surrounded by a clear halo ("owl's eye").

Transmission of CMV can occur by several mechanisms, depending on the age group affected. These include the following:

- *Transplacental transmission,* from a newly acquired or primary infection in a mother who does not have protective antibodies (congenital CMV).
- *Neonatal transmission,* through cervical or vaginal secretions at birth, or later through breast milk from a mother who has active infection (perinatal CMV).
- *Transmission through saliva* during preschool years, especially in day care centers. Toddlers so infected readily transmit the virus to their parents.
- *Transmission by the genital route* is the dominant mode after about 15 years of age. Spread may also occur via respiratory secretions and the fecal-oral route.
- *Iatrogenic transmission,* at any age through organ transplants or blood transfusions.

Acute CMV infection induces transient but severe immunosuppression. CMV can infect dendritic cells and impair antigen processing and the ability of dendritic cells to stimulate T lymphocytes. Similar to other herpesviruses, CMV can evade immune defenses by downmodulating MHC class I and II molecules and by producing homologues of TNF receptor, IL-10, and MHC class I molecules. Interestingly, CMV can evade NK cells by producing ligands that block activating receptors and class I–like proteins that engage inhibitory receptors. Thus, CMV both hides from and actively suppresses immune responses.

MORPHOLOGY

Infected cells are strikingly enlarged, often to a diameter of 40 μm, and show cellular and nuclear pleomorphism. Prominent **intranuclear basophilic inclusions** spanning half the nuclear diameter are usually set off from the nuclear membrane by a clear halo (Fig. 8-12). Within the cytoplasm of infected cells, smaller basophilic inclusions can also be seen. In the glandular organs, the parenchymal epithelial cells are infected; in the brain, the neurons; in the lungs, the alveolar macrophages and epithelial and endothelial cells; and in the kidneys, the tubular epithelial and glomerular endothelial cells. Disseminated CMV causes focal necrosis with minimal inflammation in virtually any organ.

Congenital Infections. Infection acquired in utero may take many forms. In approximately 95% of cases it is asymptomatic. However, sometimes when the virus is acquired from a mother with primary infection (who does not have protective antibodies), classic *cytomegalic inclusion disease* develops. Cytomegalic inclusion disease resembles erythroblastosis fetalis. Affected infants may suffer intrauterine growth retardation, and present with jaundice, hepatosplenomegaly, anemia, bleeding due to thrombocytopenia, and encephalitis. In fatal cases the brain is often smaller than normal (microcephaly) and may show foci of calcification. Diagnosis of neonatal CMV is made by viral culture or PCR amplification of viral DNA in urine or saliva.

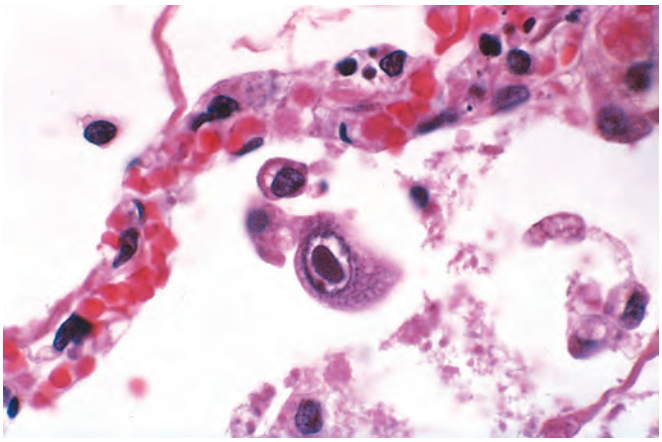

Figure 8-12 Cytomegalovirus: distinct nuclear and ill-defined cytoplasmic inclusions in the lung.