



Figure 17-31 Infectious enteritis. **A**, Histologic features of viral enteritis include increased numbers of intraepithelial and lamina propria lymphocytes and crypt hypertrophy. **B**, Diffuse eosinophilic infiltrates in parasitic infection. This case was caused by *Ascaris* (upper inset), but a similar tissue reaction could be caused by *Strongyloides* (lower inset). **C**, Schistosomiasis can induce an inflammatory reaction to eggs trapped within the lamina propria. **D**, *Entamoeba histolytica* in a colon biopsy specimen. Note some organisms ingesting red blood cells (arrow). **E**, *Giardia lamblia*, which are present in the luminal space over nearly normal-appearing villi, are easily overlooked. **F**, *Cryptosporidia* organisms are seen as small blue spheres that appear to lie on top of the brush border but are actually enveloped by a thin layer of host cell cytoplasm.

Norovirus infection in immunocompromised patients is a significant problem. Some data suggest that nearly 20% of patients on immunosuppression after renal transplantation or as treatment for graft-versus-host disease after hematopoietic stem cell transplantation are infected with norovirus and have intermittent diarrhea. Many of these patients fail to clear the infection, and diarrhea persists for an average of 9 months. The resulting malnutrition and dehydration can increase morbidity of the underlying disease.

Rotavirus. This encapsulated virus with a segmented, double-stranded RNA genome infects 140 million people and causes 1 million deaths each year, making rotavirus a common cause of severe childhood diarrhea and diarrheal mortality worldwide. Children between 6 and 24 months of age are most vulnerable. Protection in the first 6 months of life is probably due to the presence of antibodies in breast milk, while protection beyond 2 years is due to immunity that develops following the first or second infection. However, protection conferred by maternal antibodies seems to be less effective in India, Asia and Africa. Thus, in these locales infections are common in those younger than 6 months of age, hence early vaccination has been suggested. Because live, attenuated virus is

used, vaccination is contraindicated in patients with immunodeficiency. Vaccination has also been associated with intussusception, as discussed earlier.

Rotavirus outbreaks in hospitals and daycare centers are common, and infection spreads easily; the estimated minimal infective inoculum is only 10 viral particles. Rotavirus selectively infects and destroys mature enterocytes in the small intestine, and the villus surface is repopulated by immature secretory cells. Enterocyte damage may be mediated by a viral factor called non-structural protein 4 (NSP4), which can induce epithelial apoptosis. The loss of absorptive function and net secretion of water and electrolytes is compounded by an osmotic diarrhea caused by the incomplete absorption of nutrients. Like norovirus, rotavirus has a short incubation period followed by several days of vomiting and watery diarrhea.

Adenovirus. A common cause of pediatric diarrhea, adenovirus also affects immunocompromised patients. Small intestinal biopsy specimens can show epithelial degeneration but more often exhibit nonspecific villous atrophy and compensatory crypt hyperplasia. Viral nuclear inclusions are uncommon. Disease typically presents after an incubation period of 1 week with nonspecific symptoms that