irritation, infants are vulnerable to diarrhea, vomiting, and dehydration (see Chapter 22).

The liver is the most immature of all the gastrointestinal organs throughout infancy. The ability to conjugate bilirubin and secrete bile is achieved after the first couple of weeks of life. However, the capacities for gluconeogenesis, formation of plasma protein and ketones, storage of vitamins, and deaminization of amino acids remain relatively immature for the first year of life.

Maturation of the sucking, swallowing, and breathing reflexes and the eruption of teeth (see Teething later in chapter) parallel the changes in the gastrointestinal tract and prepare infants for the introduction of solid foods.

The immunologic system undergoes numerous changes during the first year. Full-term newborns receive significant amounts of maternal immunoglobulin G (IgG), which, for approximately 3 months, confers immunity against antigens to which their mothers were exposed. During this time, infants begin to synthesize IgG but in limited amounts. Approximately 40% of adult levels are reached by 1 year old; therefore, infants are at higher risk for infection during the first 12 months of life. Significant amounts of immunoglobulin M (IgM) are produced at birth, and adult levels are reached by 9 months old. Prebiotic oligosaccharides found in breast milk produce probiotic bacteria such as bifidobacteria and lactobacilli, which in turn stimulate synthesis and secretion of secretory IgA. Secretory IgA is present in large amounts in colostrum; IgA confers protection to the mucous membranes of the gastrointestinal tract (Durand, Ochoa, Bellomo, et al, 2013) against many bacteria, such as *Escherichia coli,* and viruses such as rubella, poliovirus, and the enteroviruses. The development of the mucosa-associated lymphoid tissue occurs during infancy; in part, this system is believed to prevent colonization and passage of bacteria across the infant's mucosal barrier. The function and quantity of T-lymphocytes, lymphokines, interferon-γ, interleukins, tumor necrosis factor-α, and complement are reduced in early infancy, thus preventing optimal response to certain bacteria and viruses. The production of IgA and immunoglobulins D and E (IgD and IgE) is much more gradual, and maximum levels are not attained until early childhood. **Probiotics** may have a significant role in helping the gastrointestinal tract establish a “good” bacterial