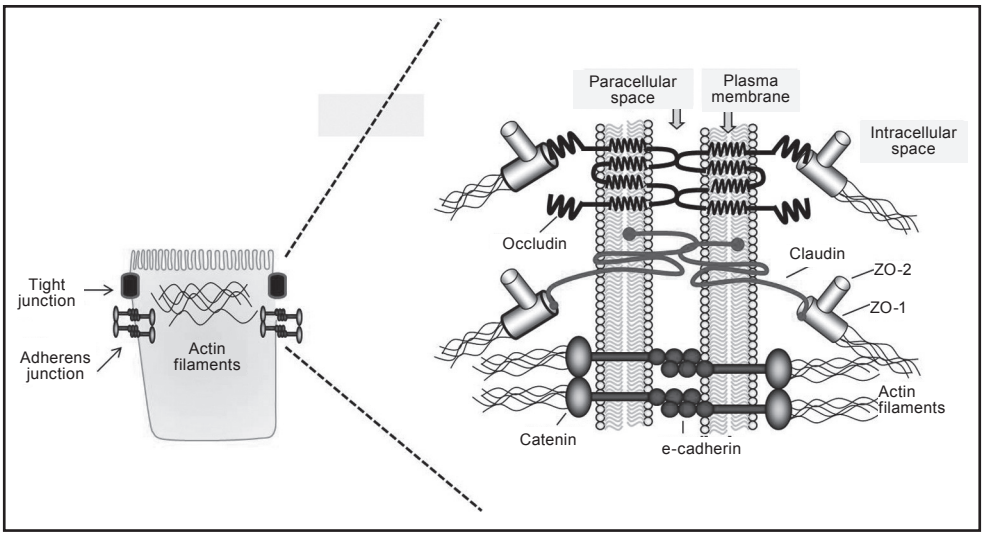

Figure 3-1. Structure of tight junctions (TJs). TJs are located at the most apical part of lateral membranes. TJ proteins interact with the actomyosin ring that surrounds the enterocyte at the level of the TJ via zonula occludens proteins (ZO-1, ZO-2, and ZO-3.) Claudins are a multigene family consisting of more than 20 different members shown to impart resistance and ion selectivity to epithelial paracellular pathways. Other proteins associated with the TJ and adherens junction (AJ) include cingulin, junctional adhesion molecules (JAMs), the Coxsackie adenovirus receptor, catenin, and E-cadherin.

the paracellular spaces are also joined together by a series of intercellular junctions along their lateral membranes.[4] At the uppermost apical surface, the junctional complex is composed of a tight junction (TJ) and an adherens junction (AJ). Both junctions are made up of complex lipoprotein structures that form fibrils that traverse the lateral plasma membrane to interact with proteins from the adjacent cell. TJ proteins also interact intracellularly with the actomyosin ring that surrounds the enterocyte at the level of the TJ via zonula occludens proteins ZO-1, ZO-2, and ZO-3 (Figure 3-1).[5,6] To date, the primary proteins identified as TJ-specific integral transmembrane proteins are the claudins and occludin. Claudins are a multigene family consisting of more than 20 different members shown to impart resistance and ion selectivity to epithelial paracellular pathways.[7] Other proteins associated with the TJ and AJ include cingulin,[8] junctional adhesion molecules (JAMs),[9] the Coxsackie adenovirus receptor,[10] catenin,[11] and E-cadherin.[12] TJ protein interactions establish a charge and size selectivity to the junctions.[13] In addition to their role in maintaining a barrier, TJs also play a key role in the control of cell polarity, differentiation, and maturation.[7]

Regulation of Tight Junctions

TJs are not static, impermeable structures, but demonstrate fluidity and enough permeability to allow leukocytes to pass through.[14,15] DCs also send dendrites through TJ to sample bacteria in the lumen and maintain the barrier by expressing TJ proteins to establish TJ-like structures with adjacent epithelial cells.[16] The Rho family of small guanosine triphosphate (GTP)-binding proteins (Rho, Rac, Cdc42) has been shown to be involved in the regulation of epithelial TJ organization and function.[17-19] F-actin organization is regulated by Rho GTPases, and the apical actin cytoskeleton is fundamental to the regulation of TJ function. Rho kinase has also been shown to regulate TJ structure and is essential for assembly of the apical junctional proteins and the F-actin cytoskeleton organization during junctional formation.[20] GTPase regulators, including GEF-H1 and Smurf1, modify epithelial barrier function.[21,22]