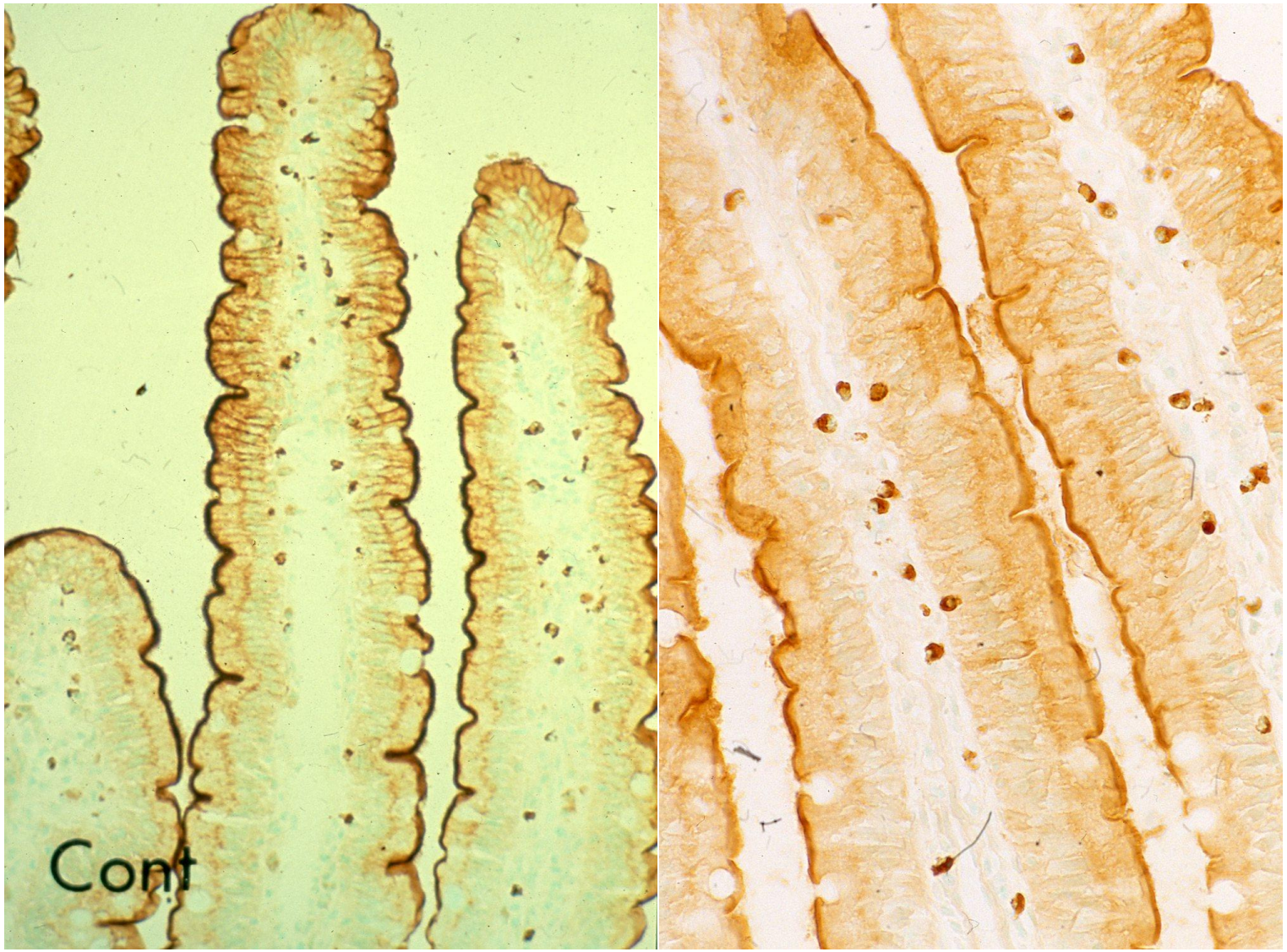
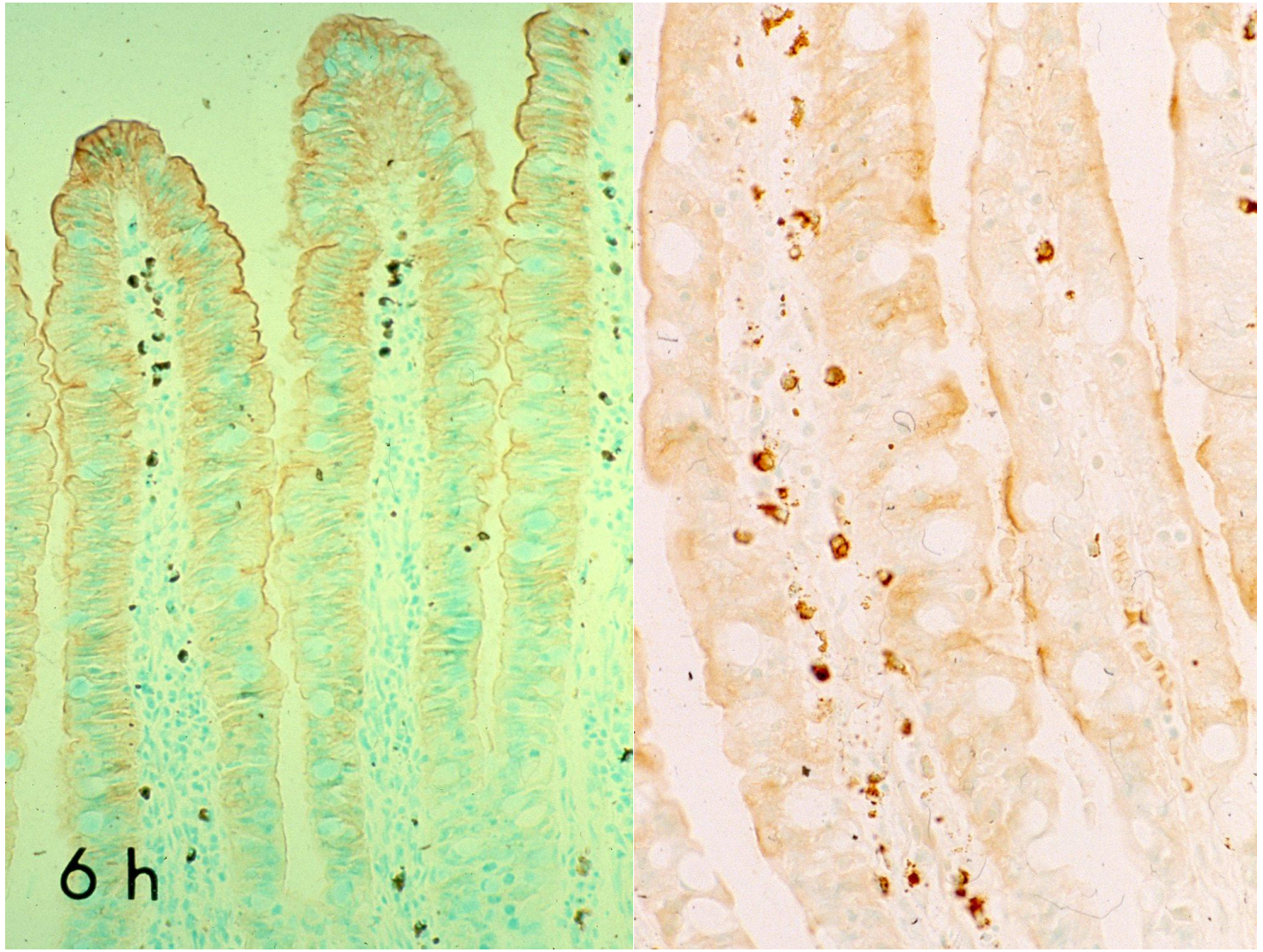
Formation of intracytoplasmic lumen in small intestinal epithelium of colchicine-treated rat

Colchicine, one of the oldest remedies for gout, is derived from the bulb-like corms of the *Colchicum autumnale* plant (autumn crocus). Colchicine binds to $\alpha\ \beta$-tubulin heterodimers and alters the tubulin conformation, thus poisoning the dynamics of microtubules in the cell. Functions of microtubules, such as mitosis, cilia movement, ameboid cellular movement and intracellular transportation, are hampered. Mitosis is suspended at the metaphase, and the failure of intracellular membrane transportation results in the formation of intracytoplasmic lumen.

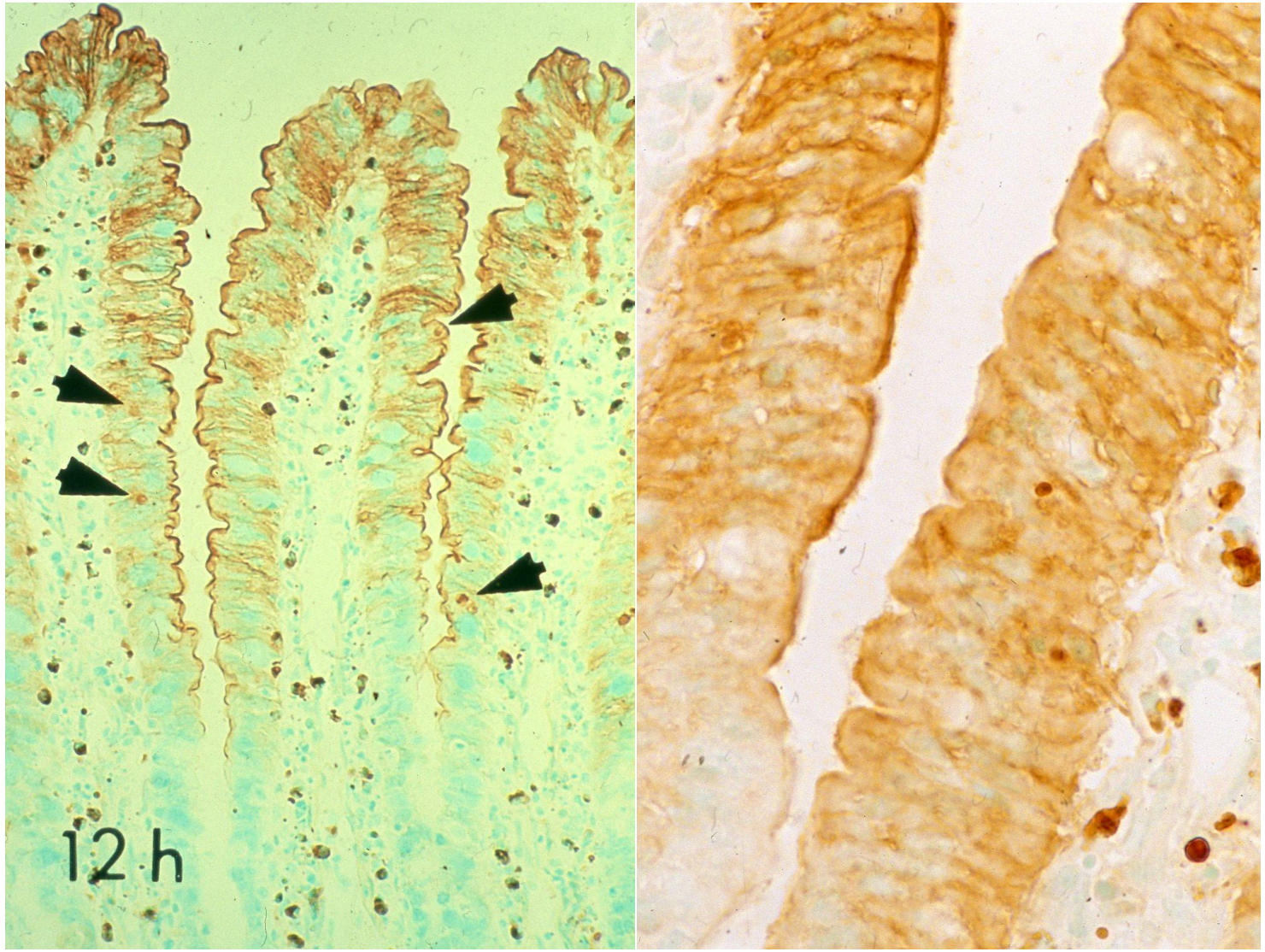
Ref.: Dasgeb B, et al. Colchicine: an ancient drug with novel applications. Br J Dermatol 2018; 178(2): 350-356. doi: 10.1111/bjd.15896



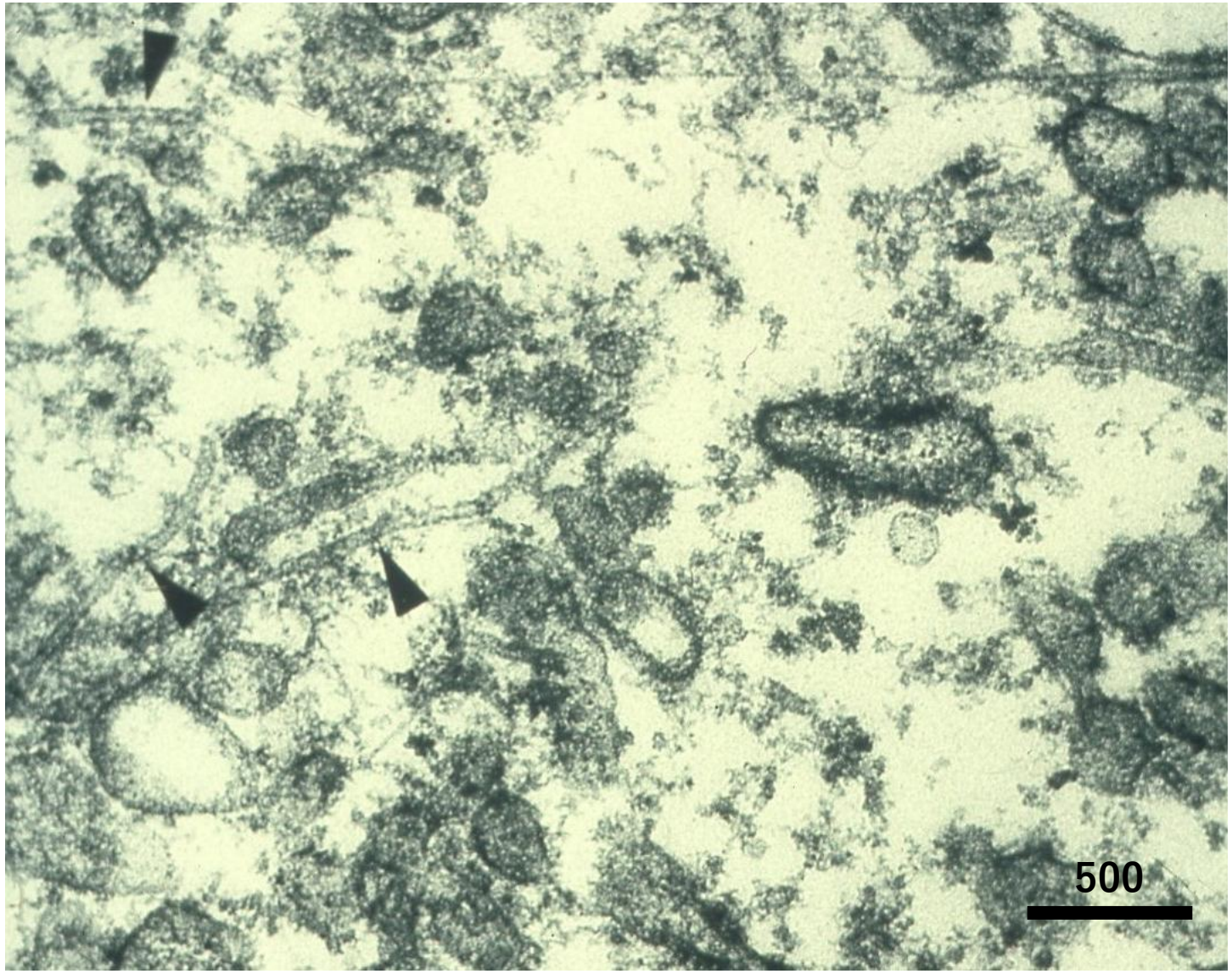
Alkaline phosphatase (ALP) activity in the small intestine of the normal (control) rat. ALP is strongly expressed on the apical surface. The lateral membrane and Golgi area are also weakly reactive. Neutrophils in the stroma is ALP-reactive. ALP-1



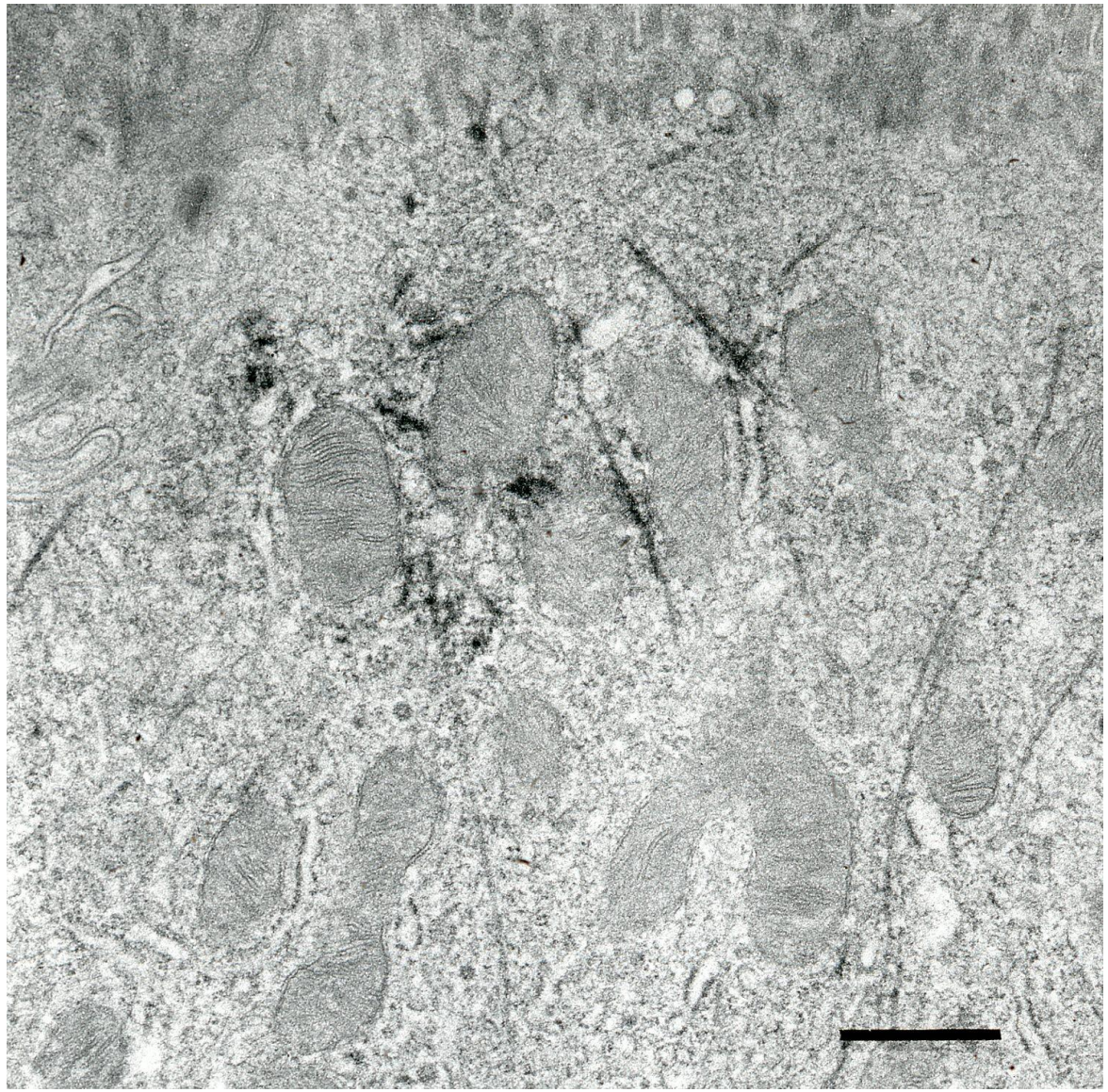
Alkaline phosphatase (ALP) activity in the small intestine of the rat treated with colchicine (0.5 mg/100 g body weight). Six hours after colchicine administration, ALP activity on the apical surface is weakened. Golgi reactivity has been lost, and the basal plasma membrane turned to be positive for ALP activity. ALP-2



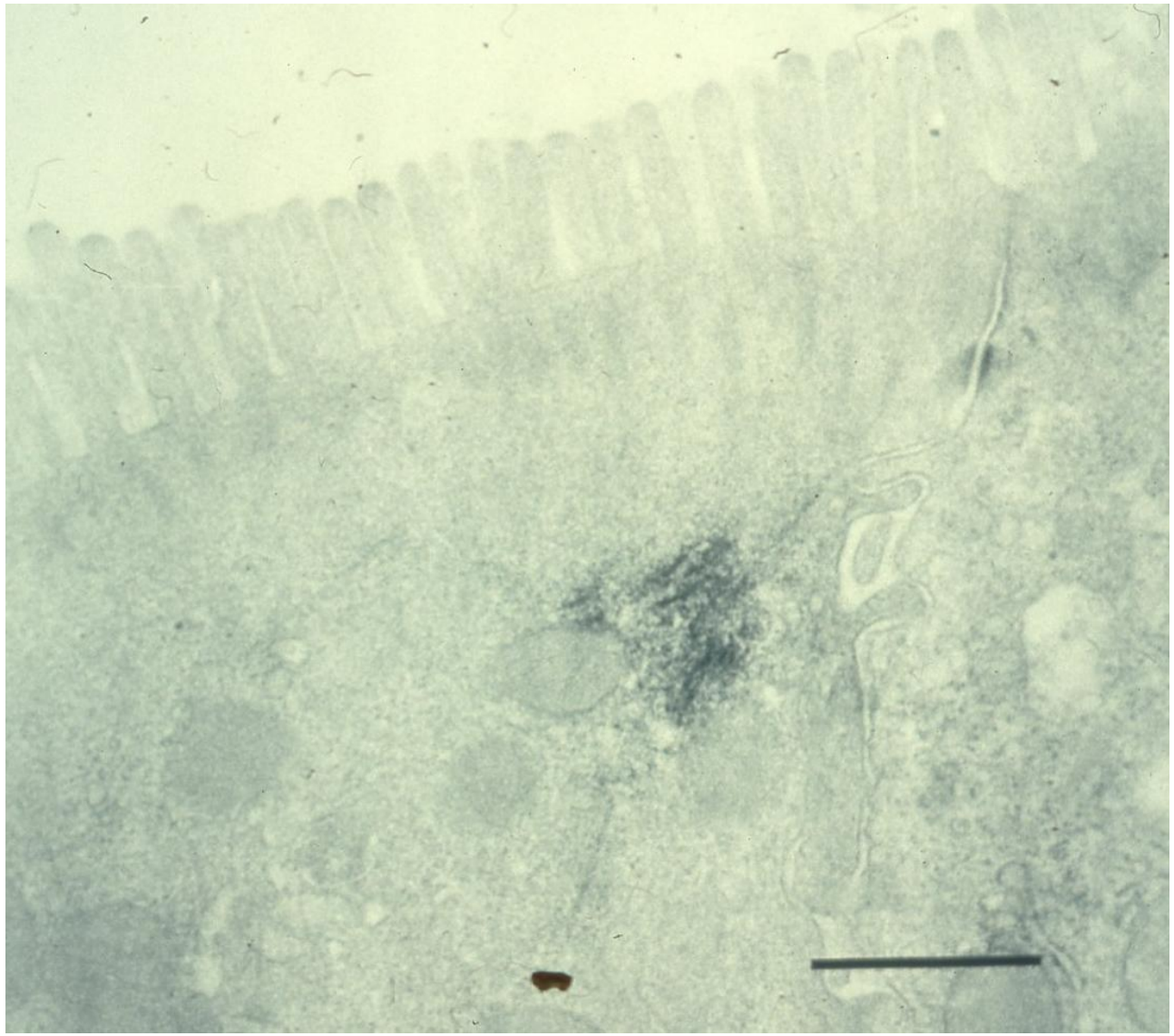
Alkaline phosphatase (ALP) activity in the small intestine of the rat treated with colchicine (0.5 mg/100 g body weight). Twelve hours after colchicine administration, ALP-positive intracytoplasmic lumina are formed in the cytoplasm (arrows). ALP-2



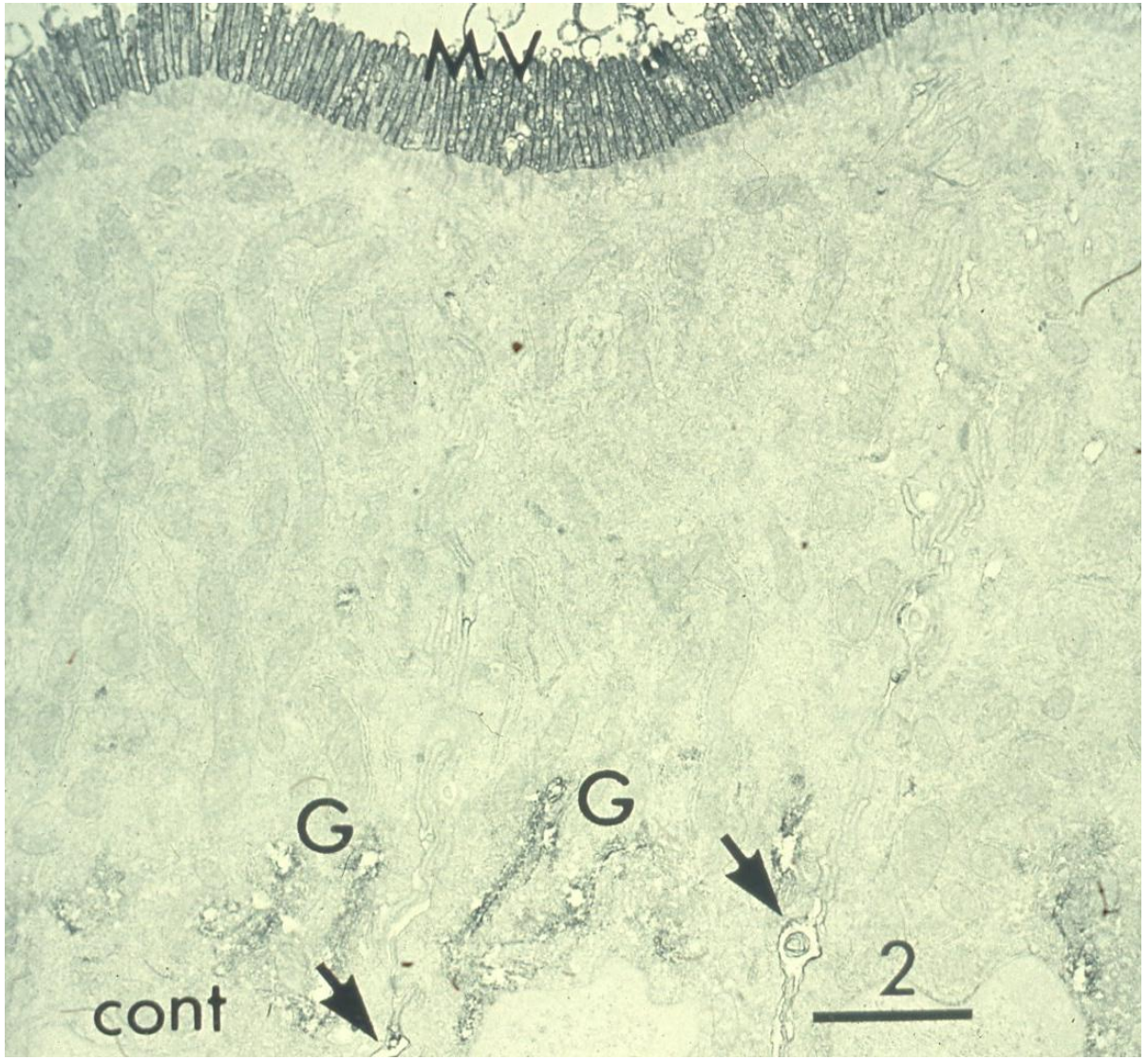
Electron microscopy of microtubules in the small intestinal epithelium of the normal rat. Microtubules, the molecular target of colchicine, are scattered in the cytoplasm. Bar = 500 nm



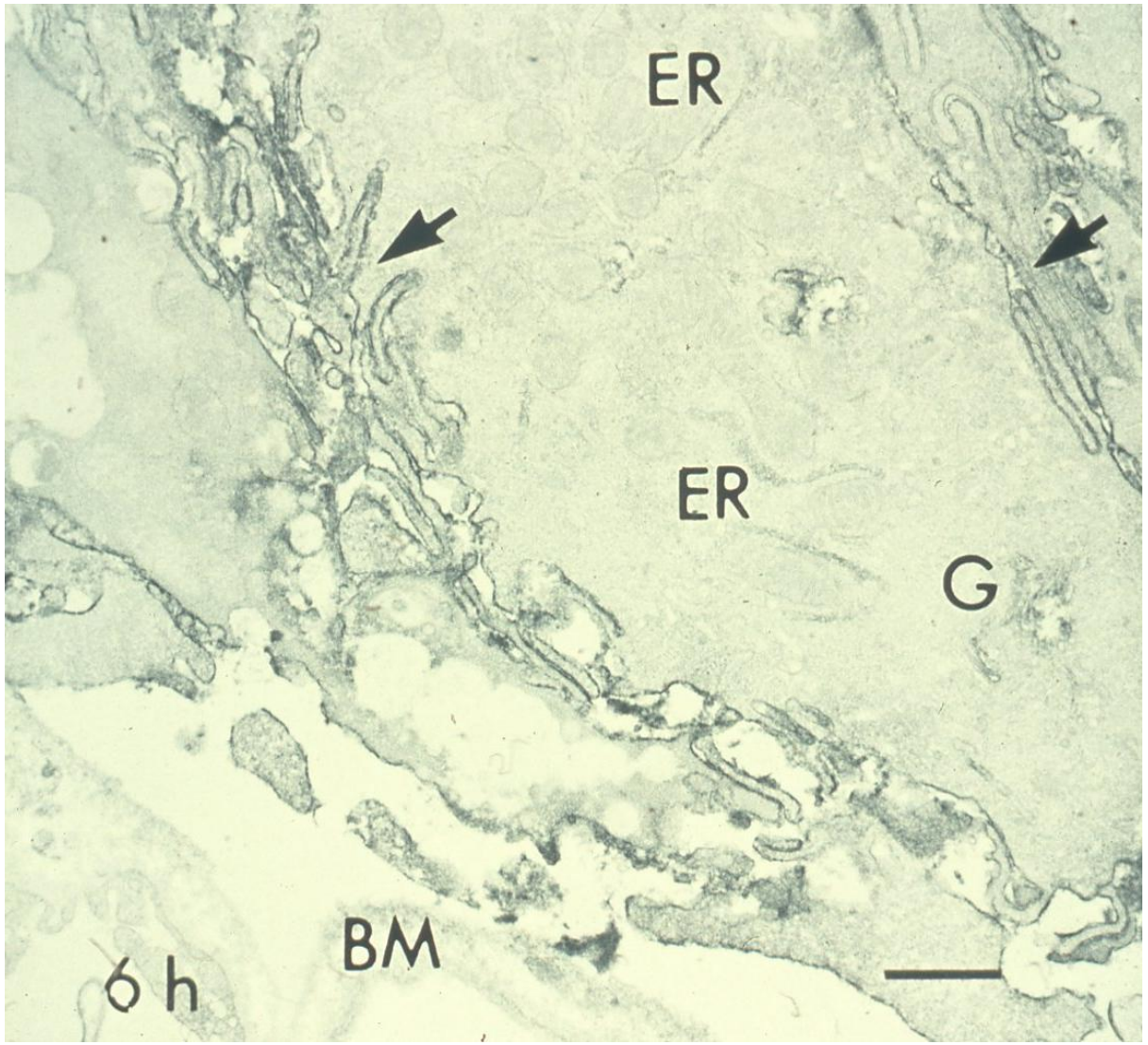
Immunoelectron microscopic visualization of alpha-tubulin in the small intestinal epithelium of the normal rat. The distribution of microtubules, the molecular target of colchicine, is demonstrated. Pre-embedding immunoelectron microscopy for alpha-tubulin. Bar = 1 μm



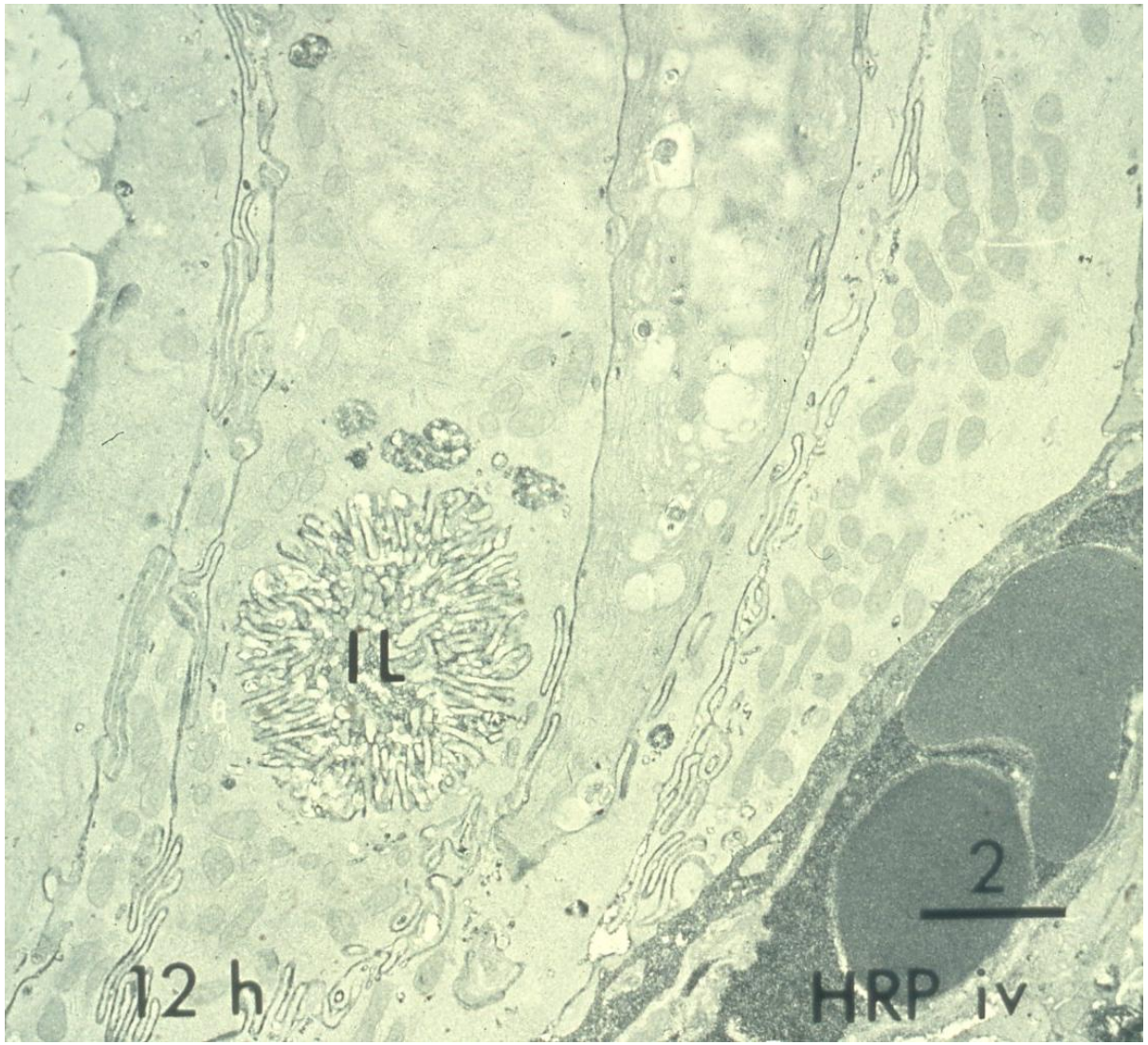
Immunoelectron microscopic visualization of alpha-tubulin in the small intestinal epithelium of the rat 6 hours after colchicine treatment. The microtubular structure is disorganized, and disassembled microtubules are visualized. Pre-embedding immunoelectron microscopy for alpha-tubulin. Bar = 1 μm



Ultrastructural demonstration of alkaline phosphatase (ALP) activity in the small intestinal epithelium of the normal rat. ALP activity is demonstrated in the surface microvilli (MV), Golgi apparati (G) and lateral plasma membranes (arrows). Bar = 2 μm



Ultrastructural demonstration of alkaline phosphatase (ALP) activity in the rat small intestinal epithelium, 6 hours after intraperitoneal colchicine administration. Strong ALP activity is demonstrated on the basal plasma membrane, and microvillous plasma membrane is invaginated into the cytoplasm (arrows). G: Golgi apparati, ER: endoplasmic reticulum, BM: basement membrane. Bar = 1 μm



Ultrastructural demonstration of intracytoplasmic lumen (IL) in the rat small intestinal epithelium, 12 hours after intraperitoneal colchicine administration. Horseradish peroxidase (HRP) was injected intravenously to visualize plasma membranes clearly. Colchicine induces microvilli-lined IL formation in normal intestinal epithelial cells. Bar = 2 μm