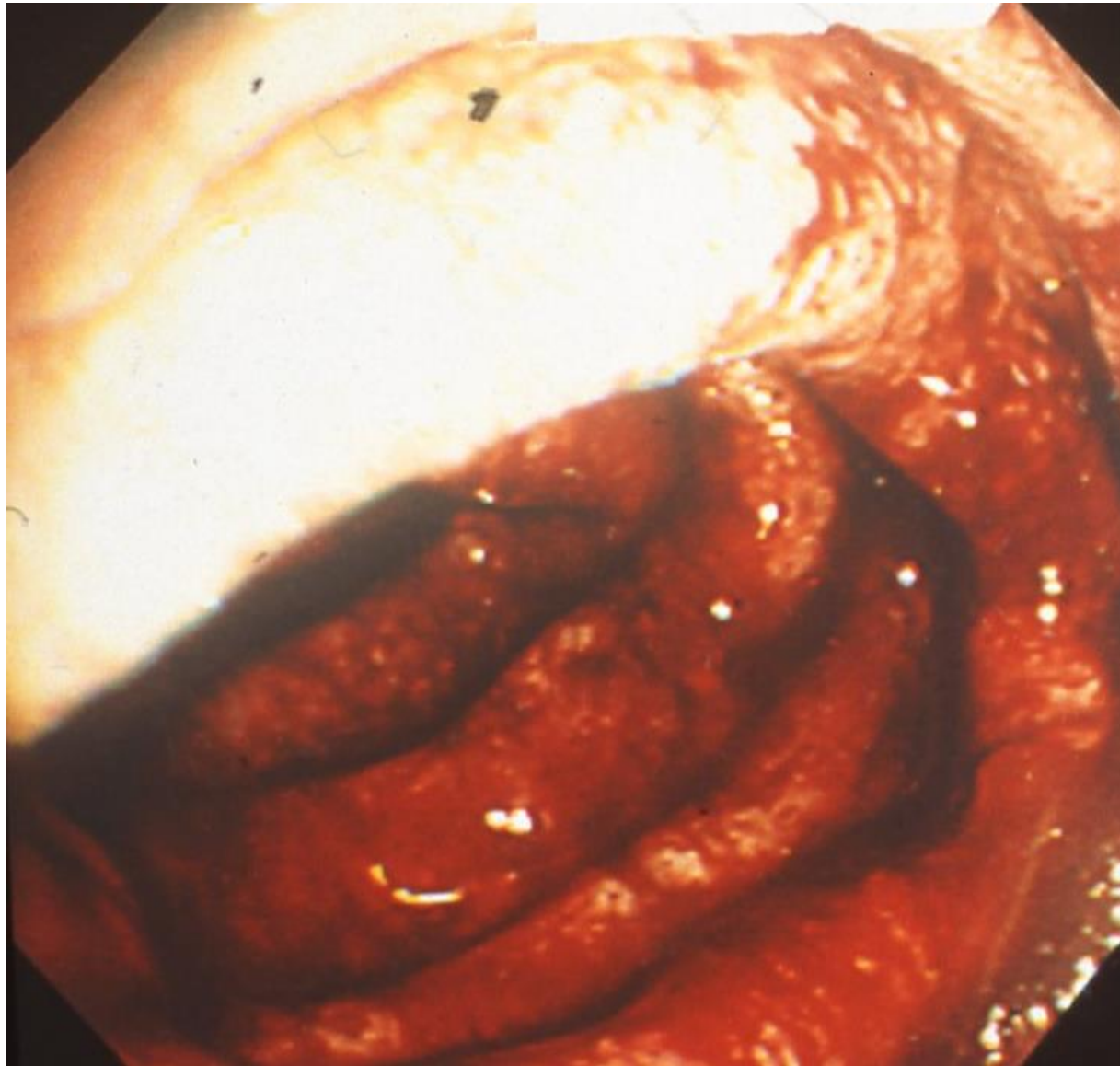


Whipple's disease (*Tropheryma whipplei* infection)

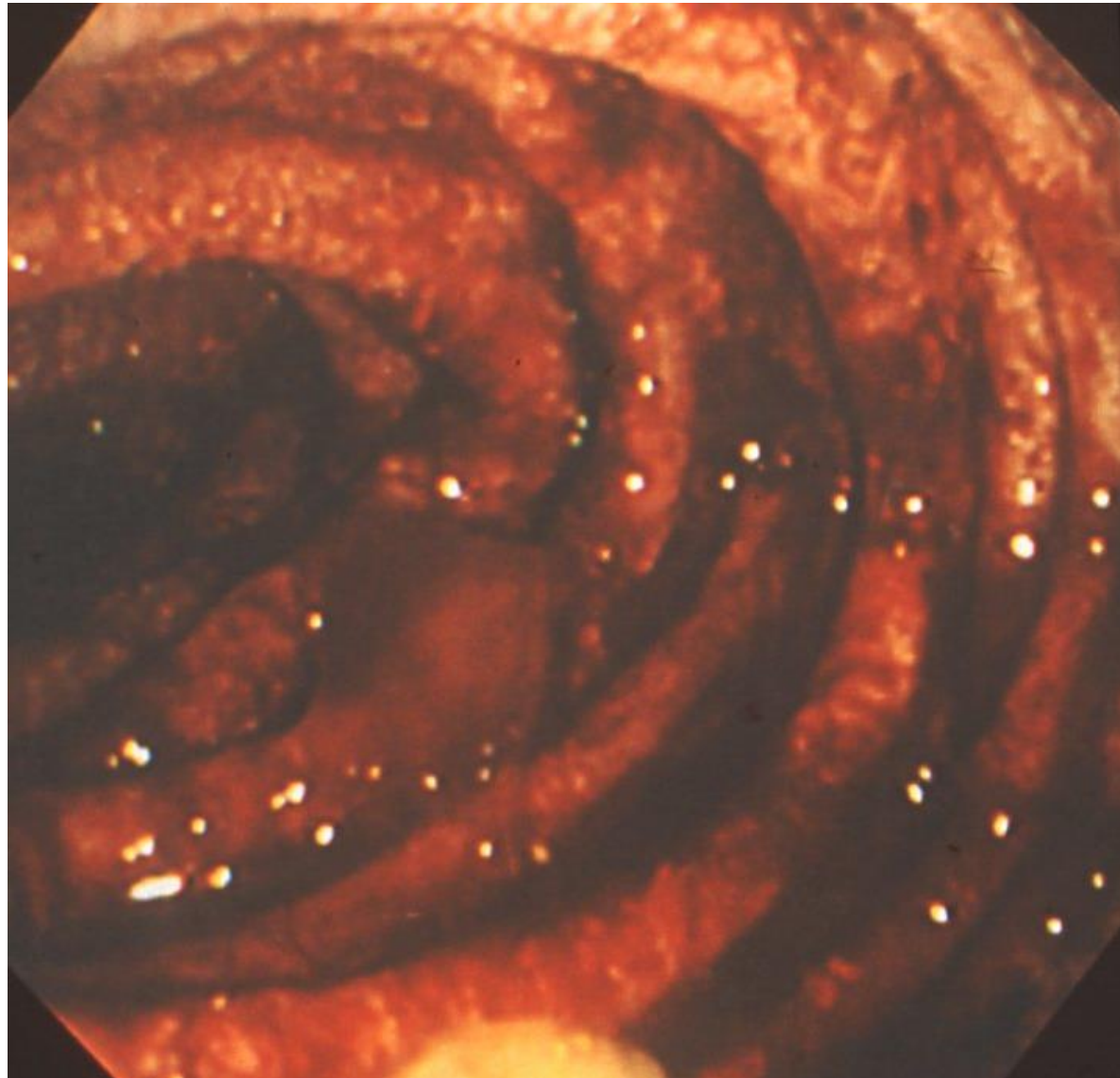
Whipple's disease is a multiorgan systemic disease caused by chronic infection of *Tropheryma whipplei*, a member of *Actinomycetales* usually found in soil. Patients with Whipple's disease manifest gastrointestinal symptoms such as watery diarrhea, malabsorption, weight loss and abdominal pain. Arthropathy, endocarditis and neurologic disease may be associated. The disease is seen among middle-aged individuals with male predominance. Farmers or persons in contact with soil or animals are relatively susceptible. Microscopically, the lack of inflammatory response allows the bacteria to accumulate at the sites of infection. In the lamina propria of the small intestinal mucosa, numerous rods are seen in and outside of foamy macrophages. PAS reactions clearly visualize the pathogen, a diagnostically useful microscopic findings. An insufficient *Tropheryma whipplei*-specific Th1 response may be responsible for an impaired immunological clearance of the bacteria.

Ref.-1: Ahmad AI, et al. Whipple's disease review, prevalence, mortality, and characteristics in the United States: a cross-sectional national inpatient study. *Medicine (Baltimore)* 2022; 101(49): e32231. doi: 10.1097/MD.00000000000032231

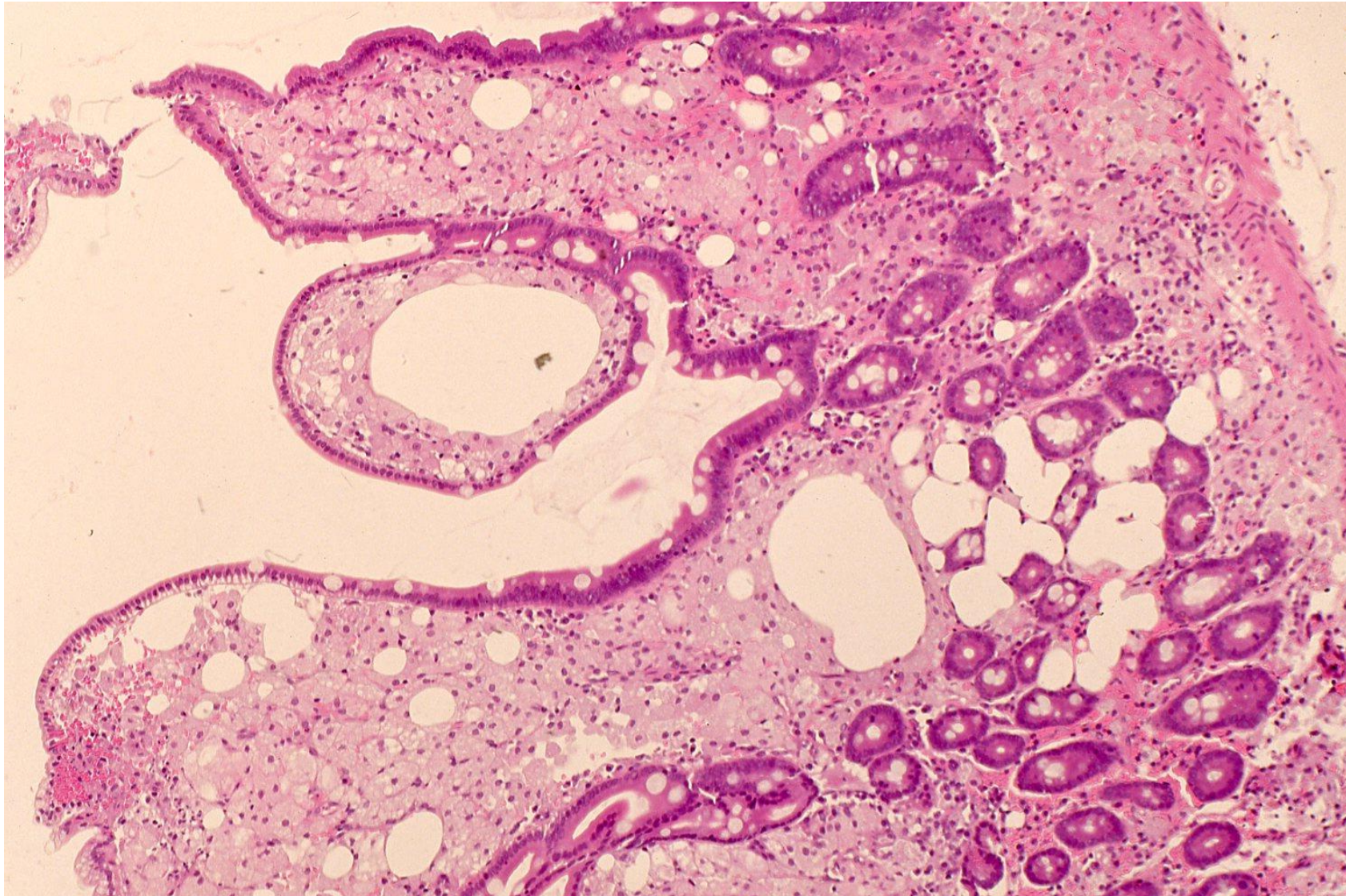
Ref.-2: Bureš J, et al. Whipple's disease: our own experience and review of the literature. *Gastroenterol Res Pract* 2013; 2013: 478349. doi: 10.1155/2013/478349



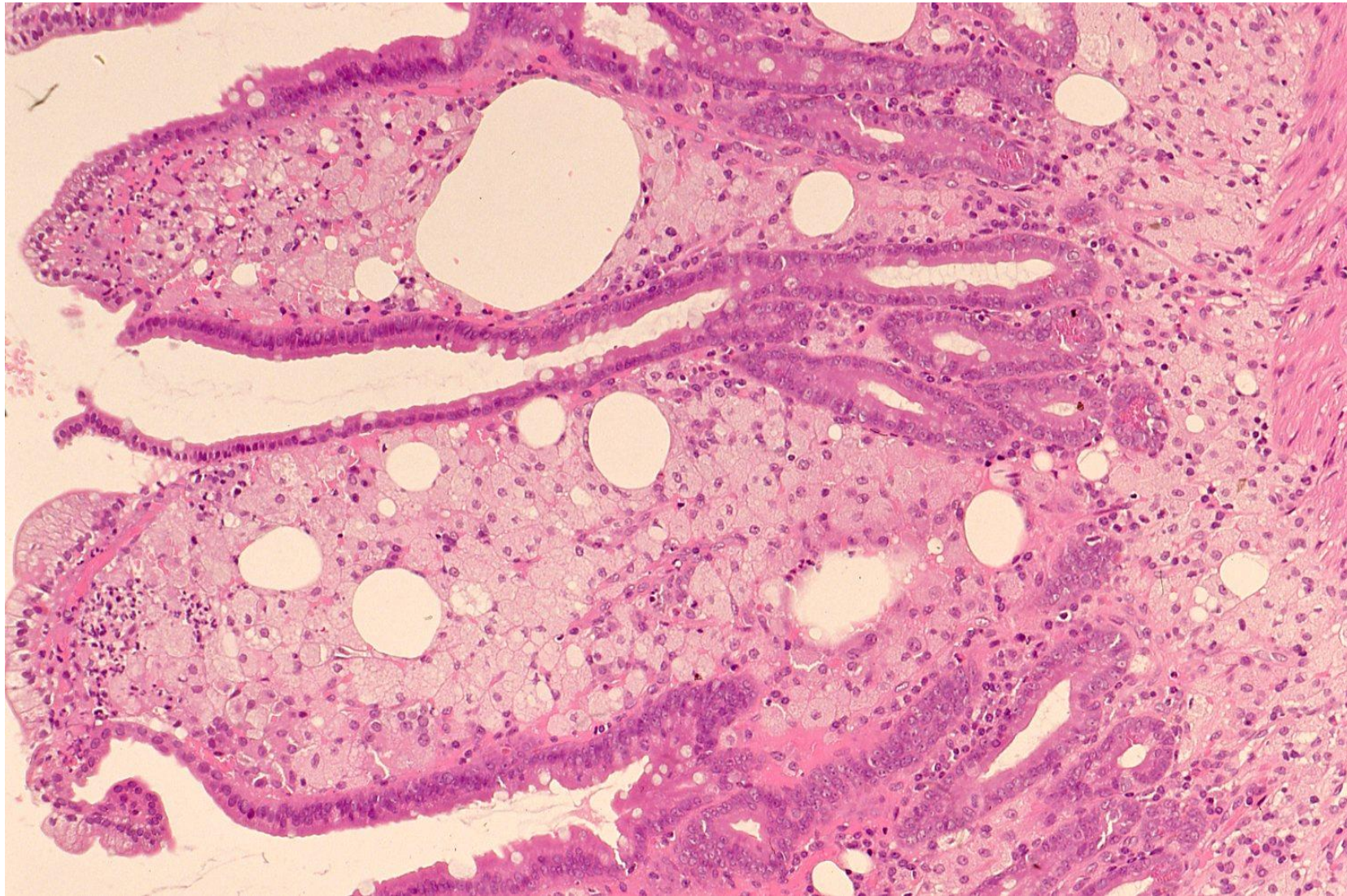
Whipple's disease in a 70-year-old male patient. Endoscopic findings of the duodenal mucosa reveal marked hyperemia and yellowish colored dots or micronodules.



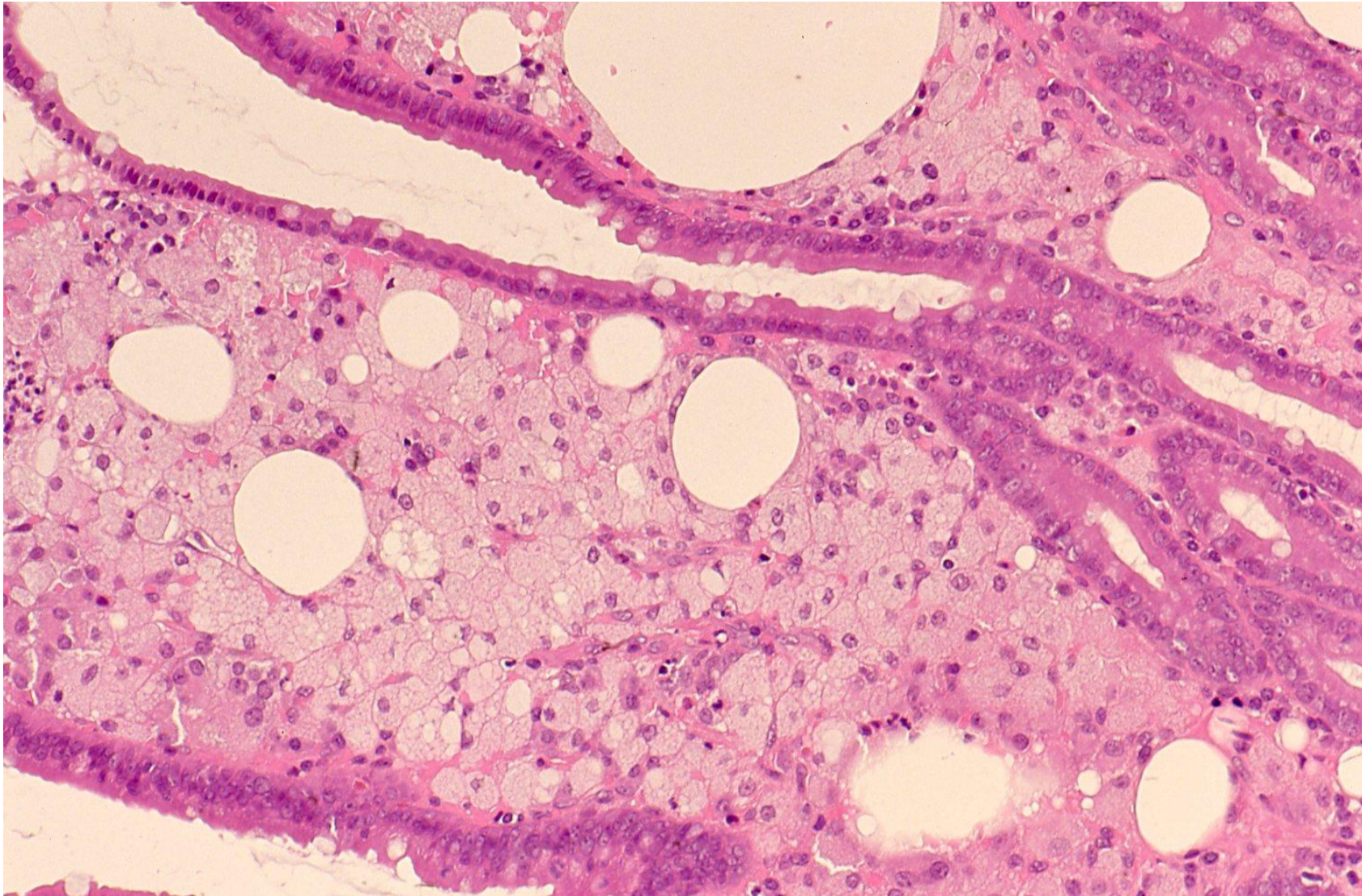
Whipple's disease in a 70-year-old male patient. Endoscopic findings of the duodenal mucosa reveal marked hyperemia and yellowish colored dots or micronodules.



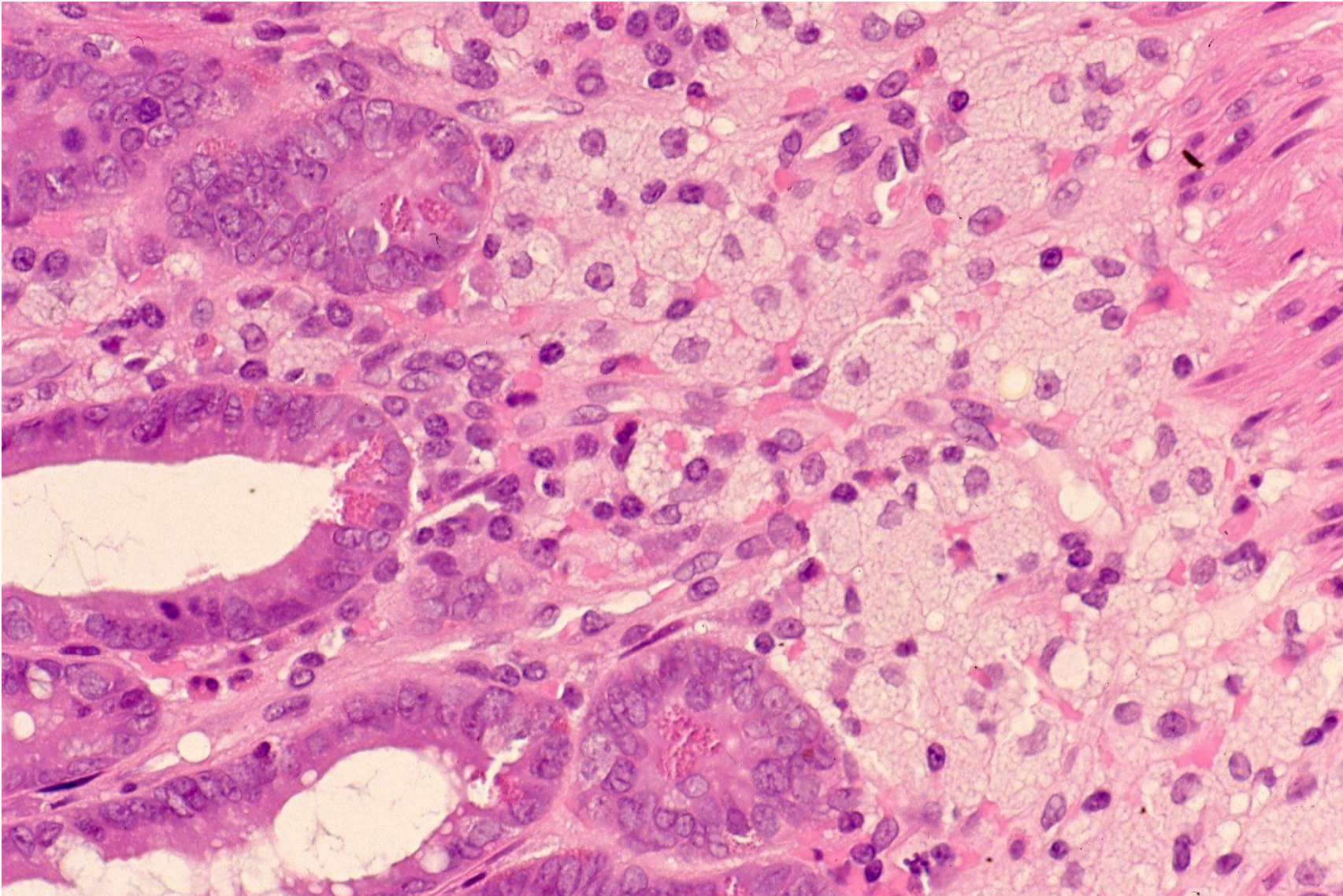
Whipple's disease in a 70-year-old male patient. Duodenal biopsy reveals marked accumulation of foamy macrophages in the lamina propria mucosae. Lymphangiectasia is associated. H&E-1



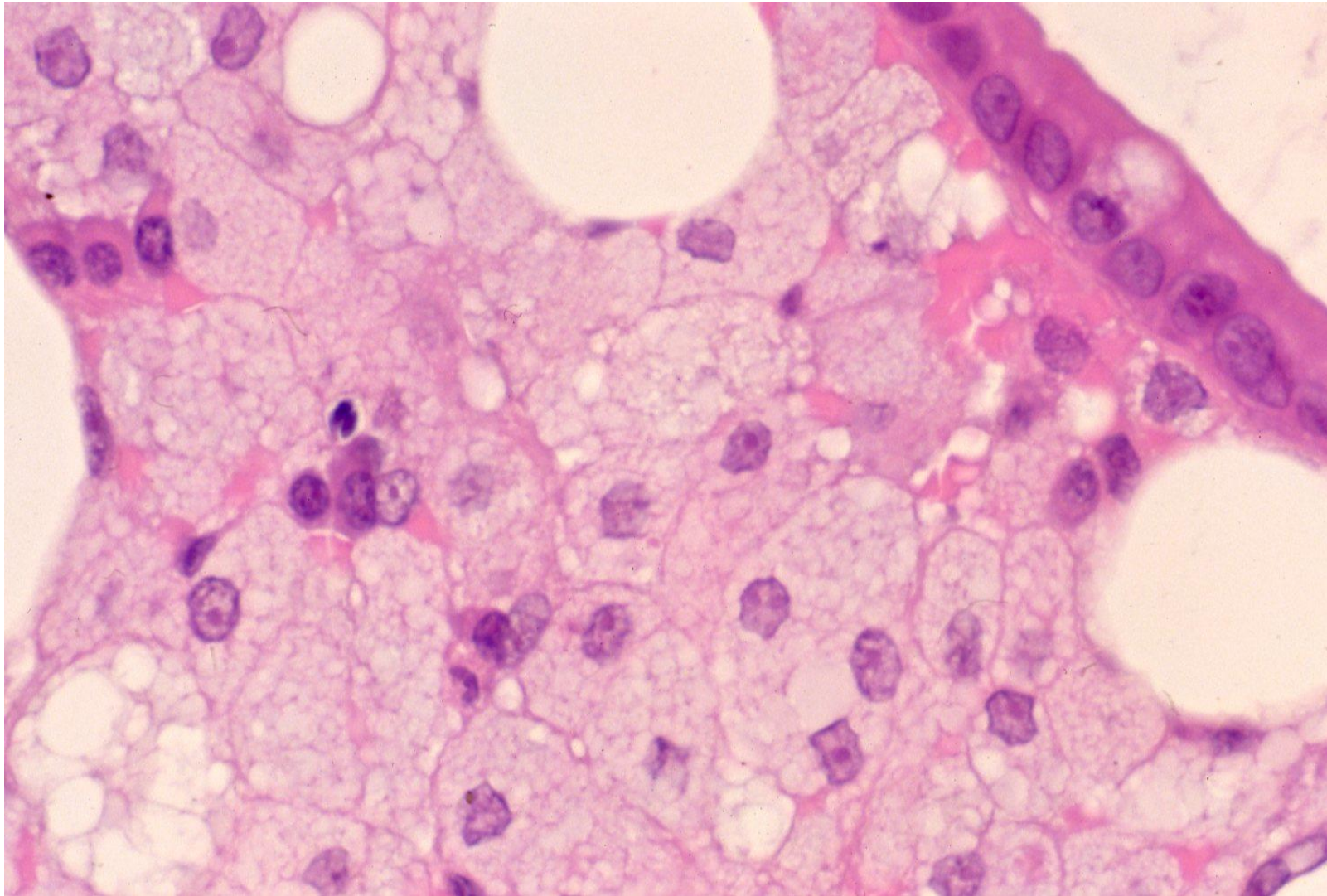
Whipple's disease in a 70-year-old male patient. Duodenal biopsy reveals marked accumulation of foamy macrophages in the lamina propria mucosae. Lymphangiectasia is associated. H&E-2



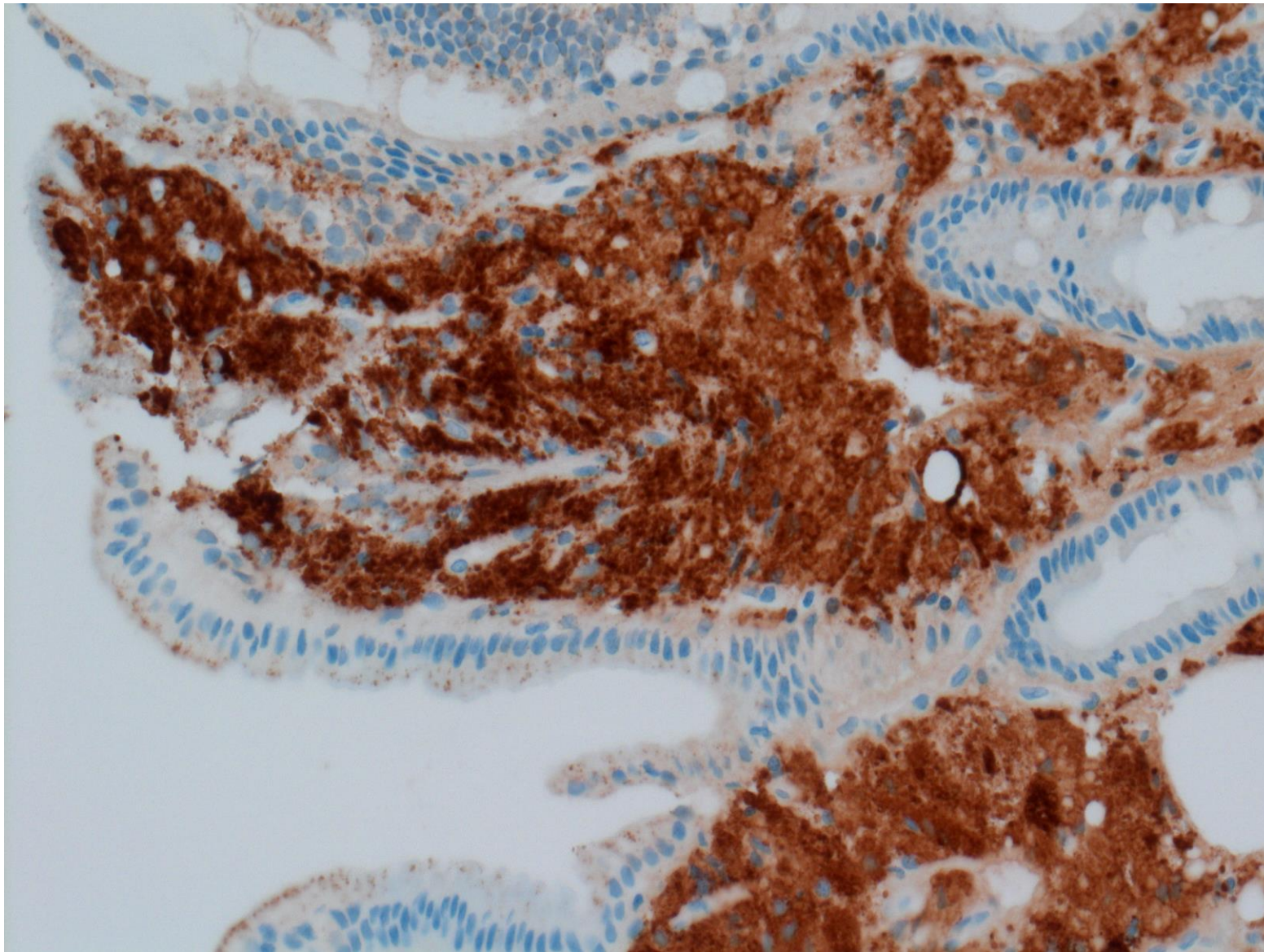
Whipple's disease in a 70-year-old male patient. Duodenal biopsy reveals marked accumulation of foamy macrophages in the lamina propria mucosae. Lymphangiectasia is associated. H&E-3



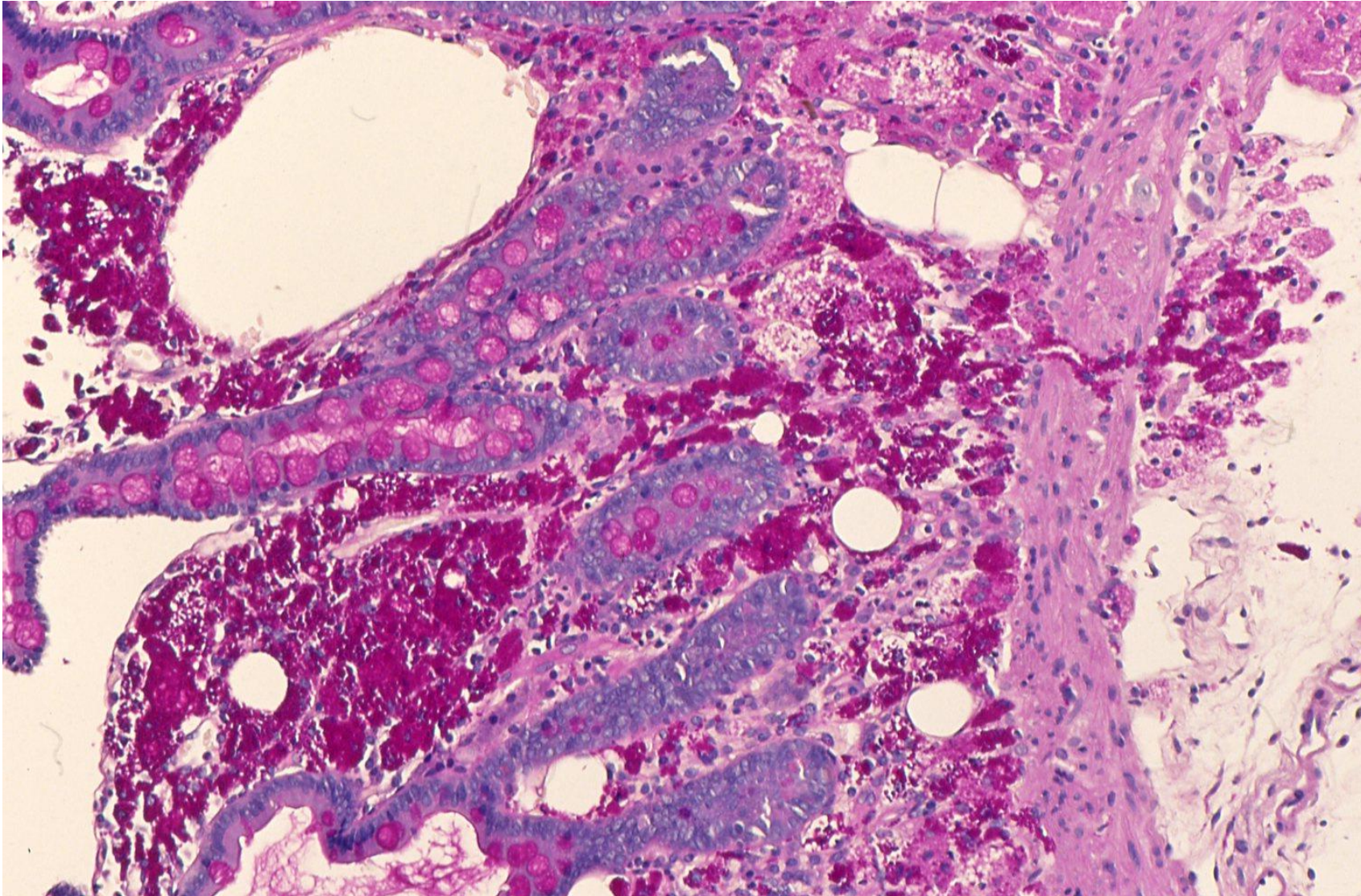
Whipple's disease in a 70-year-old male patient. Duodenal biopsy reveals marked accumulation of foamy macrophages in the lamina propria mucosae. Lymphangiectasia is associated. H&E-4



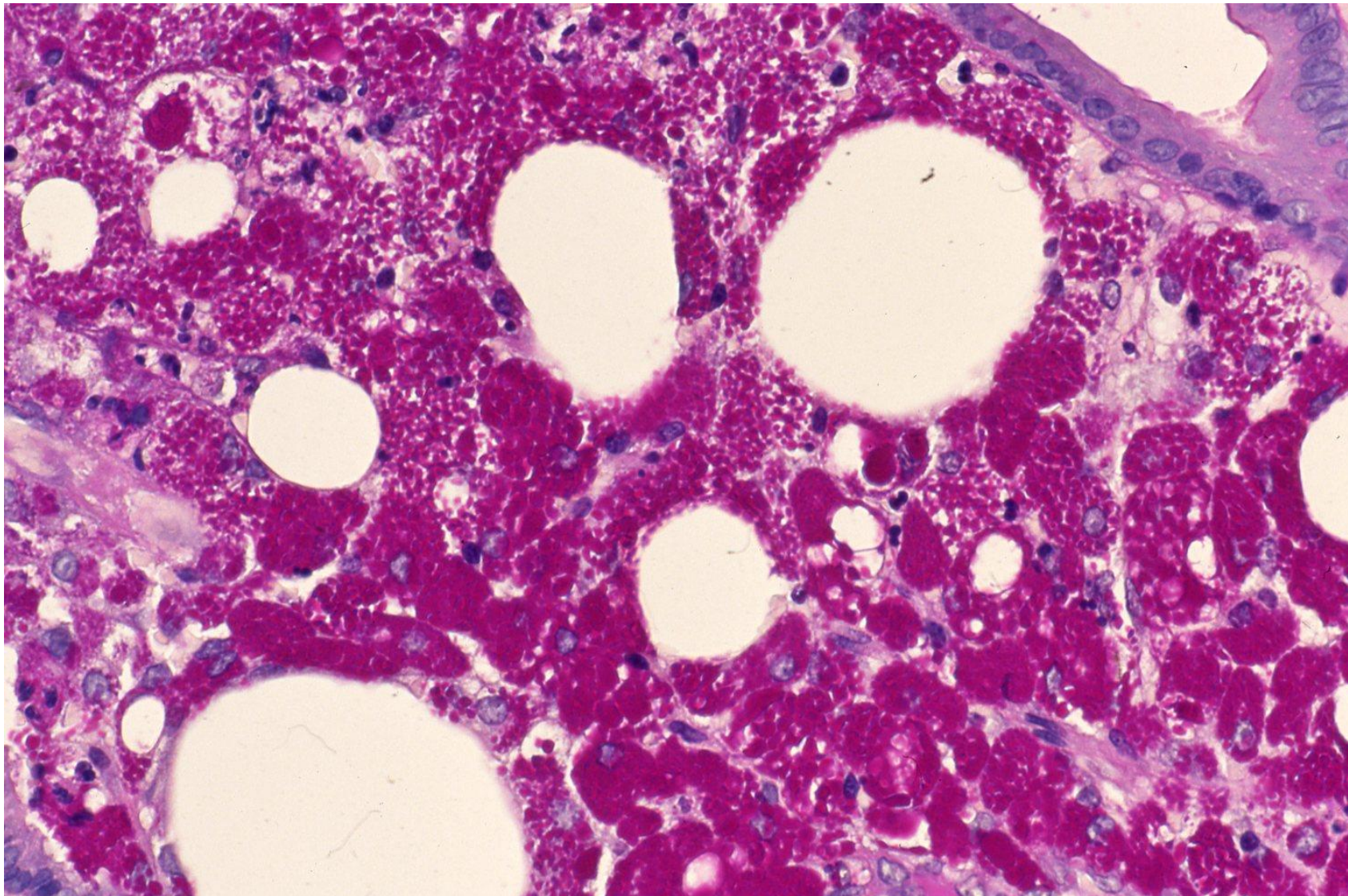
Whipple's disease in a 70-year-old male patient. Duodenal biopsy reveals marked accumulation of foamy macrophages in the lamina propria mucosae. Foamy microvesicular appearance is evident in the cytoplasm of the macrophages. Lymphangiectasia is associated. H&E-5



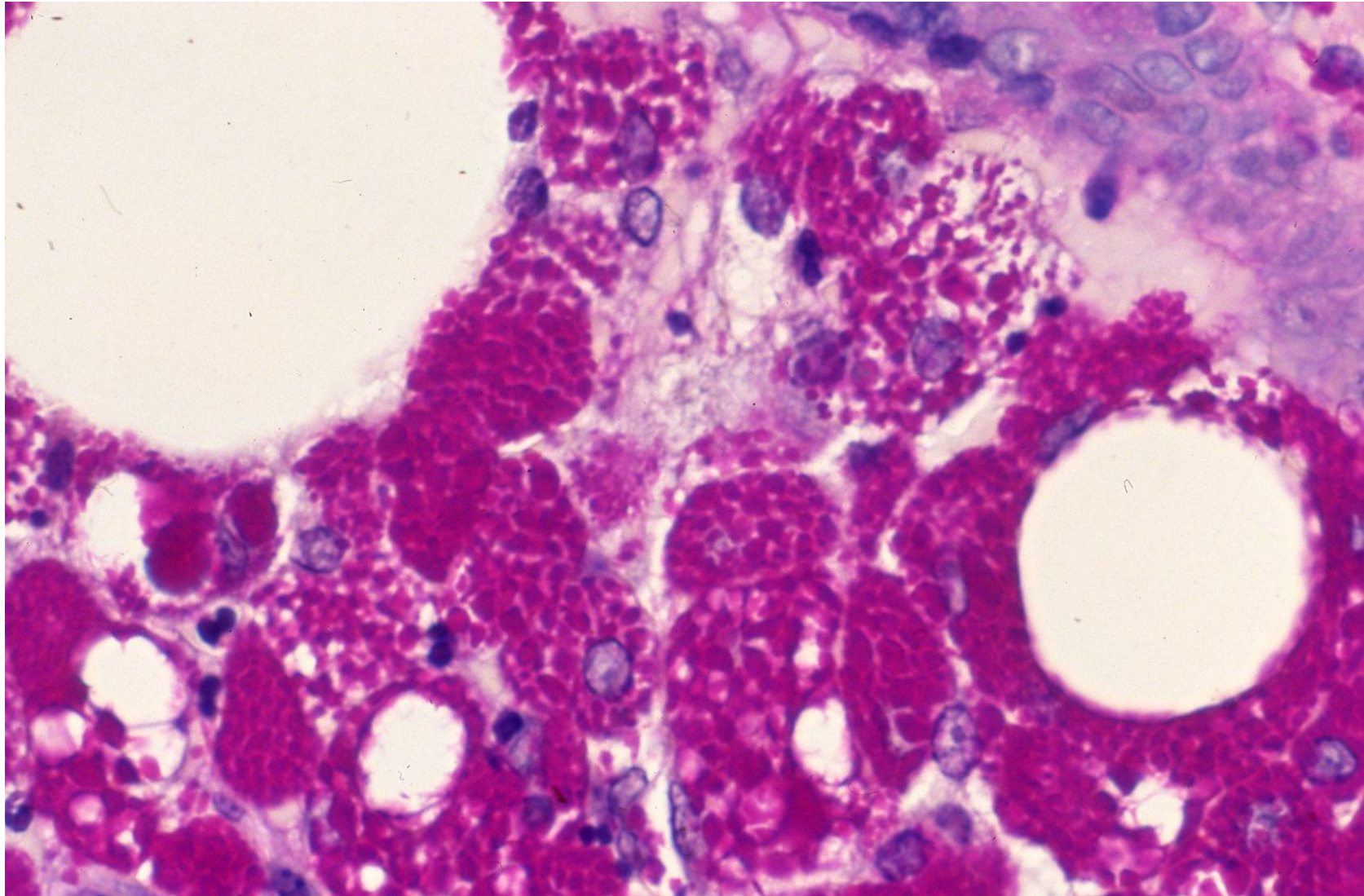
Whipple's disease in a 70-year-old male patient. Duodenal biopsy reveals marked accumulation of CD68-positive foamy macrophages in the lamina propria mucosae. Immunostaining for CD68



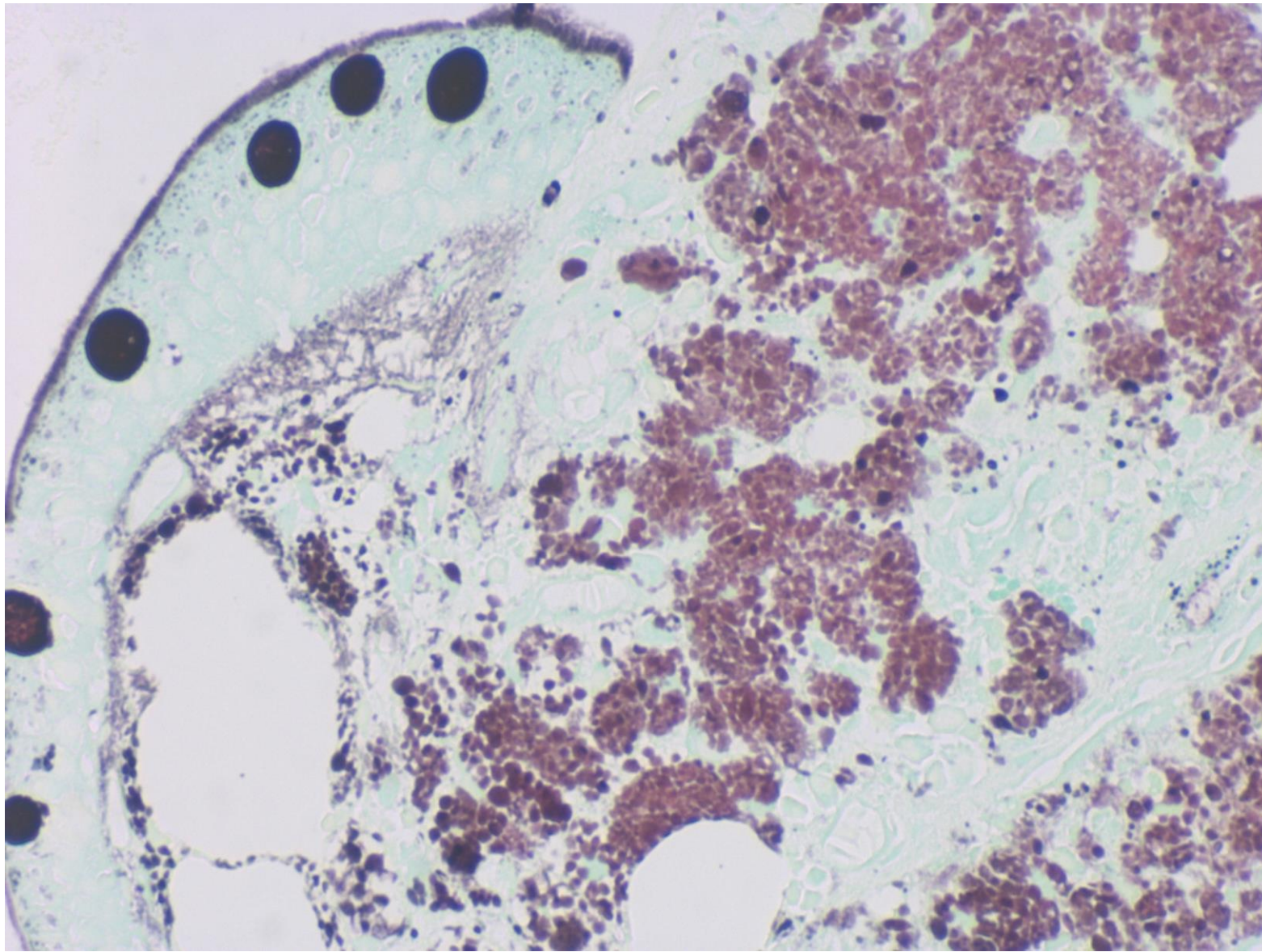
Whipple's disease in a 70-year-old male patient. Duodenal biopsy reveals marked accumulation of PAS-reactive macrophages in the lamina propria mucosae. PAS-1



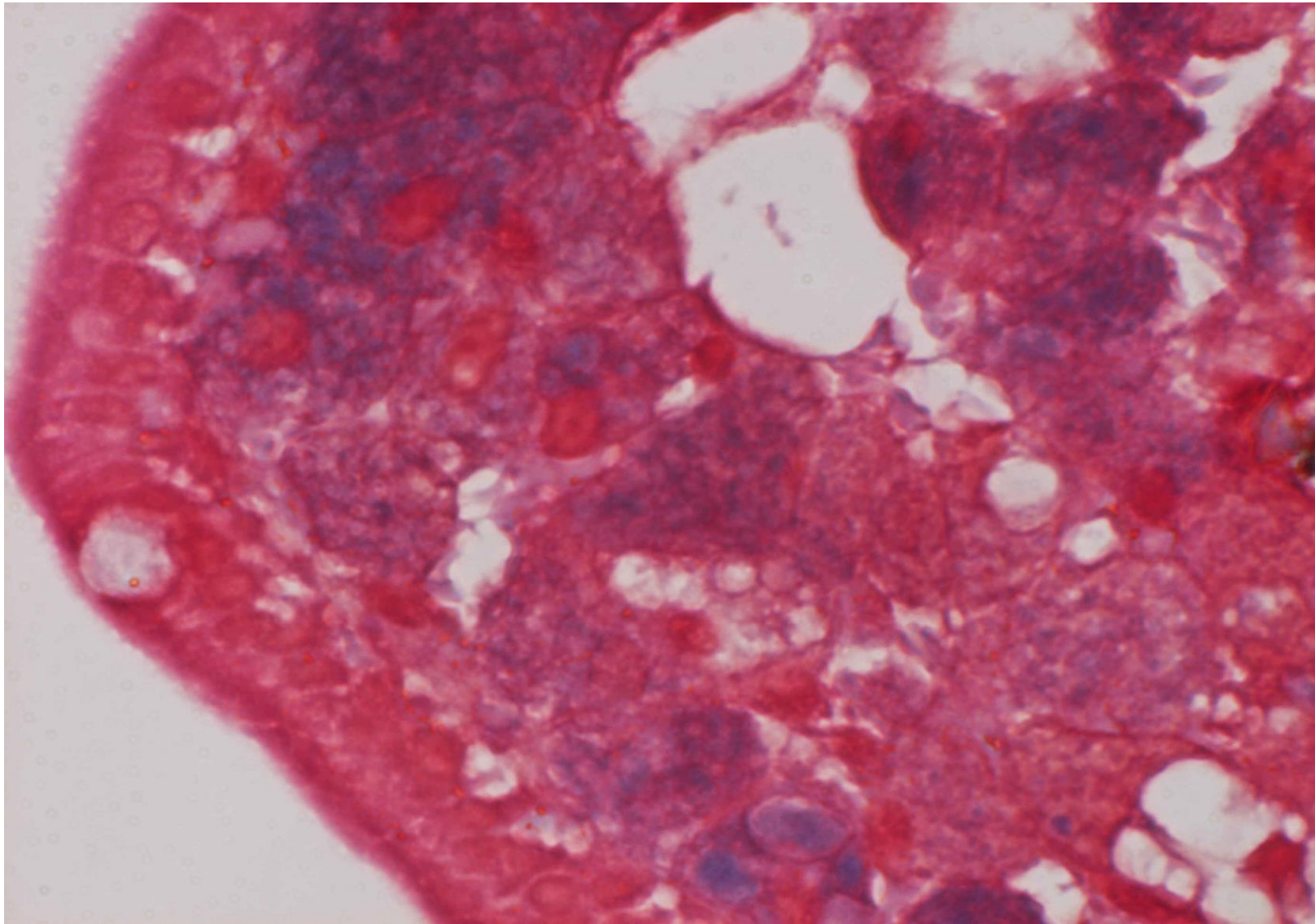
Whipple's disease in a 70-year-old male patient. Duodenal biopsy reveals marked accumulation of PAS-reactive macrophages in the lamina propria mucosae. PAS-2



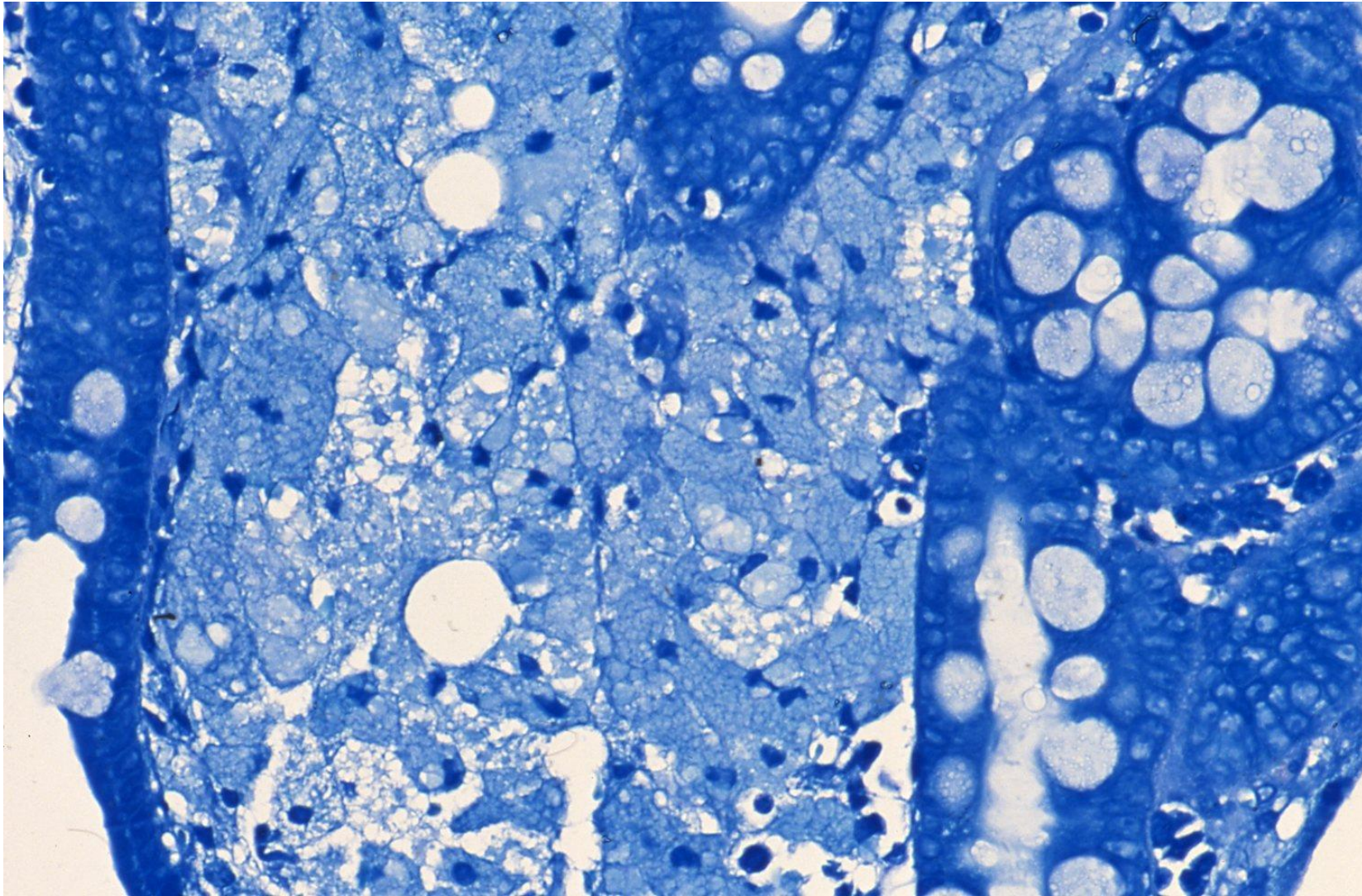
Whipple's disease in a 70-year-old male patient. Duodenal biopsy reveals marked accumulation of PAS-reactive macrophages in the lamina propria mucosae. The granular substances are clearly visible in the cytoplasm of the macrophages. PAS-3



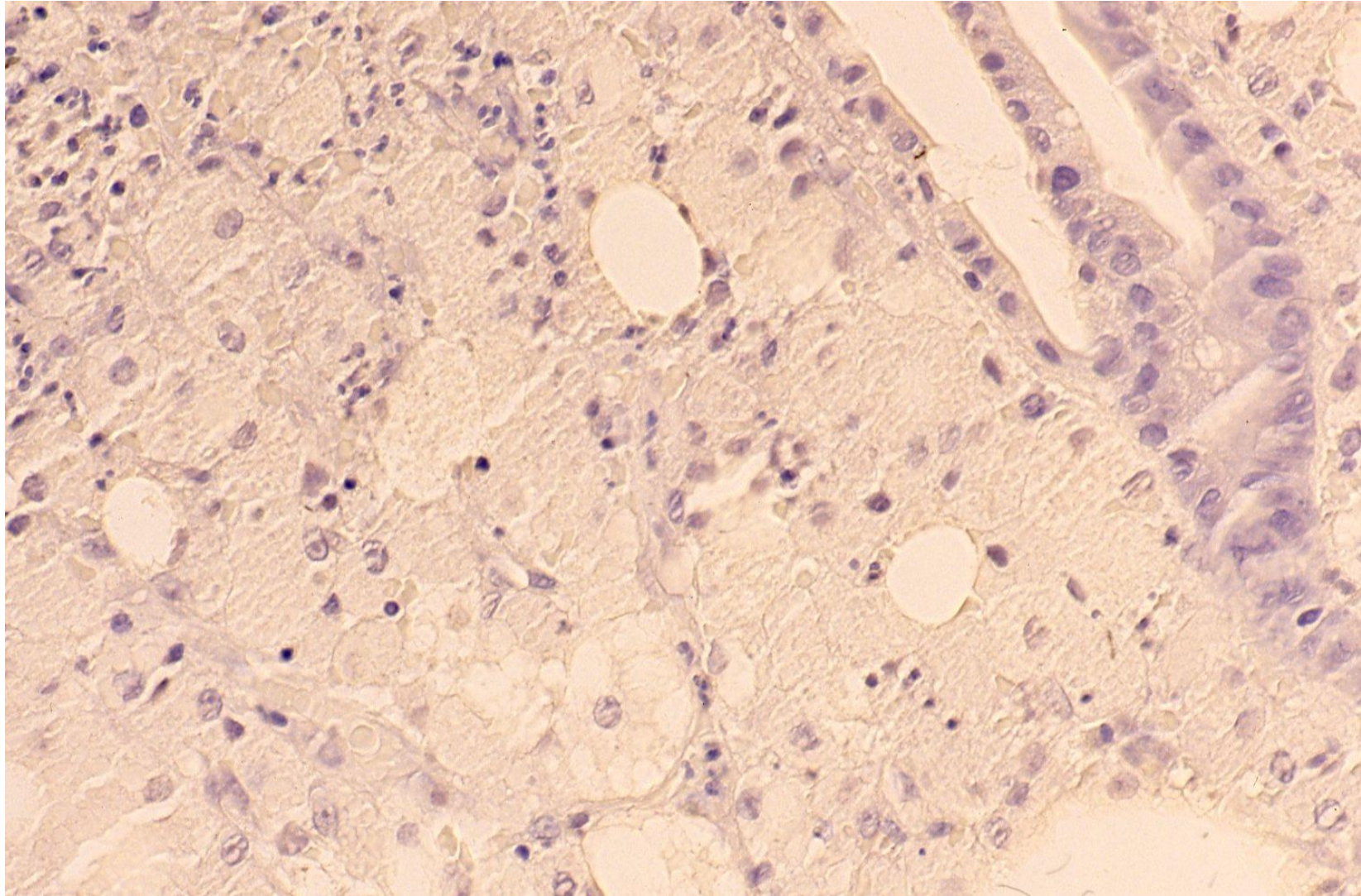
Whipple's disease in a 70-year-old male patient. In the duodenal biopsy, the macrophages accumulated in the lamina propria mucosae are Grocott-positive. Grocott



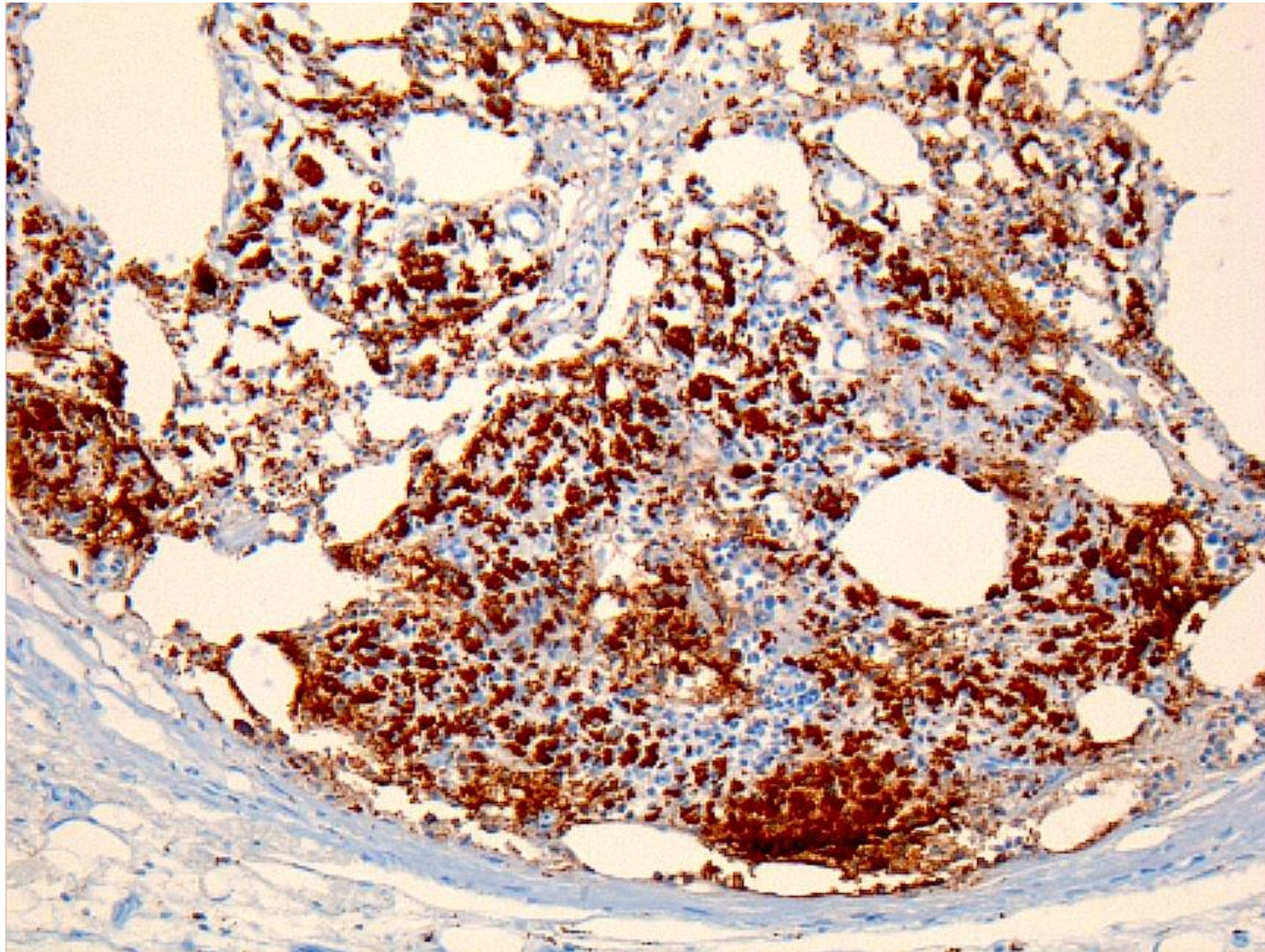
Whipple's disease in a 70-year-old male patient. In the duodenal biopsy, the bacteria growing in the macrophages are weakly Gram-positive. Gram



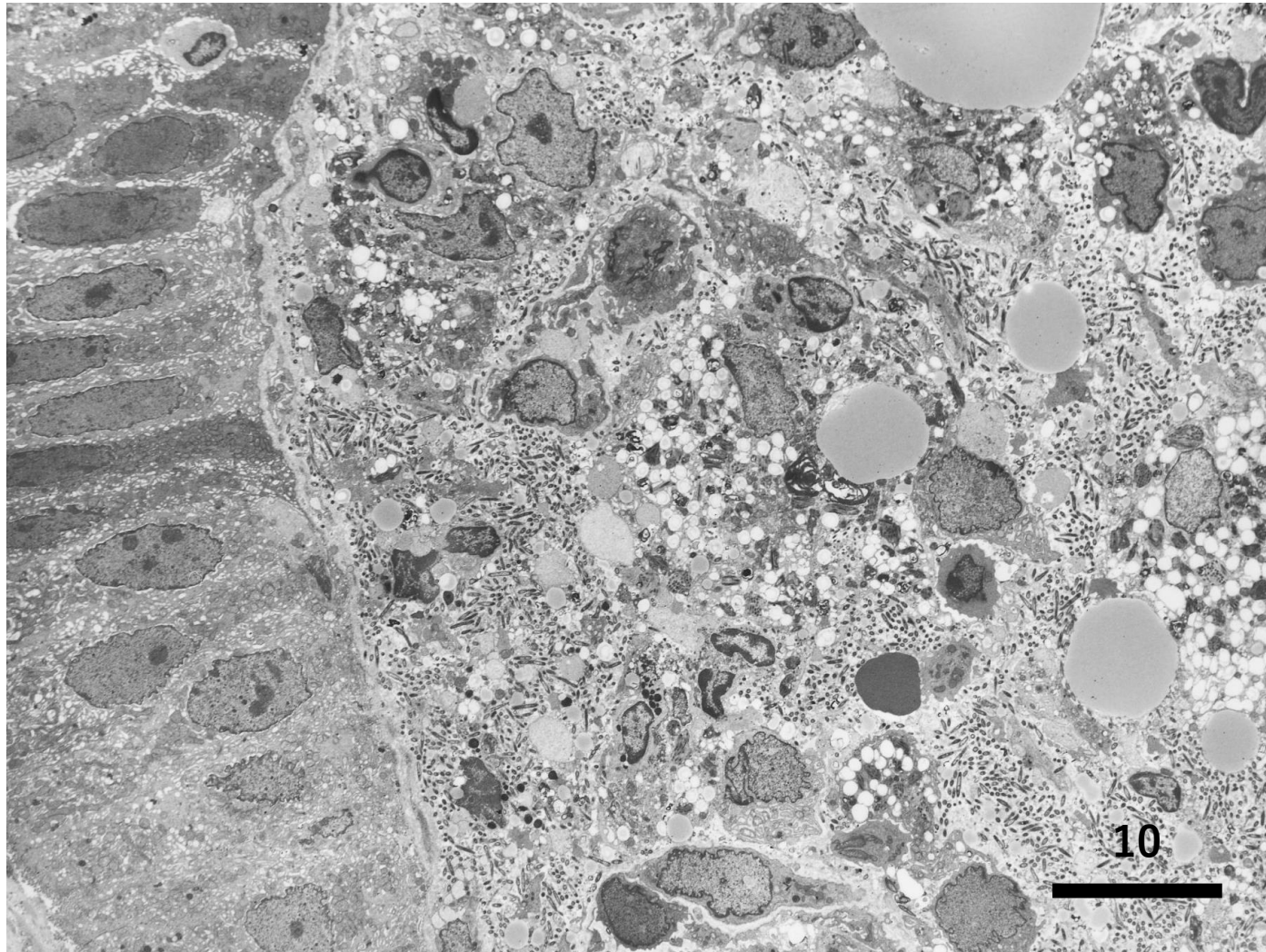
Whipple's disease in a 70-year-old male patient. In the duodenal biopsy, the bacteria growing in the macrophages are negative for acidfastness. Ziehl-Neelsen's staining



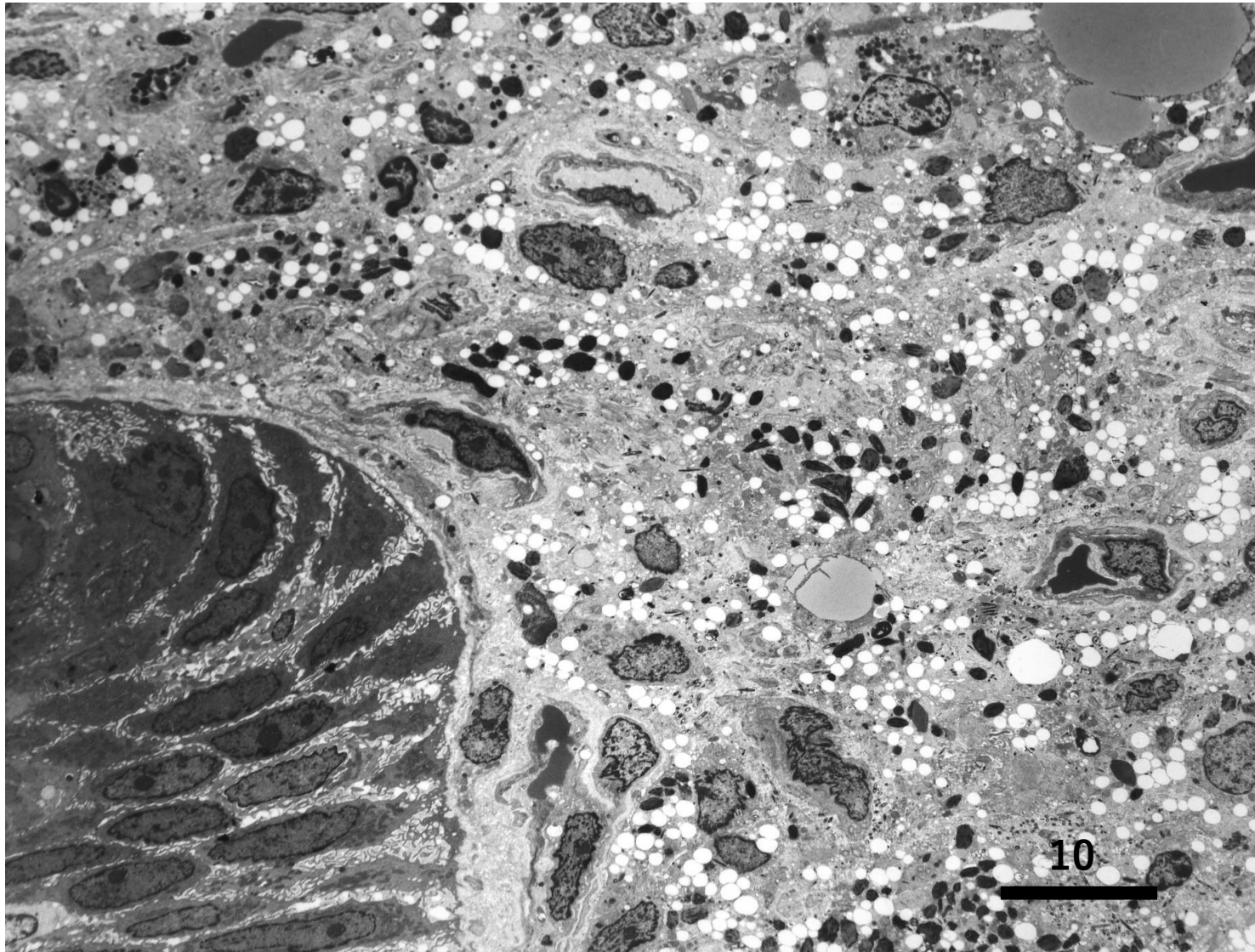
Whipple's disease in a 70-year-old male patient. In the duodenal biopsy, the bacteria growing in the macrophages are negative for BCG immunoreactivity. Immunostaining for BCG antigens



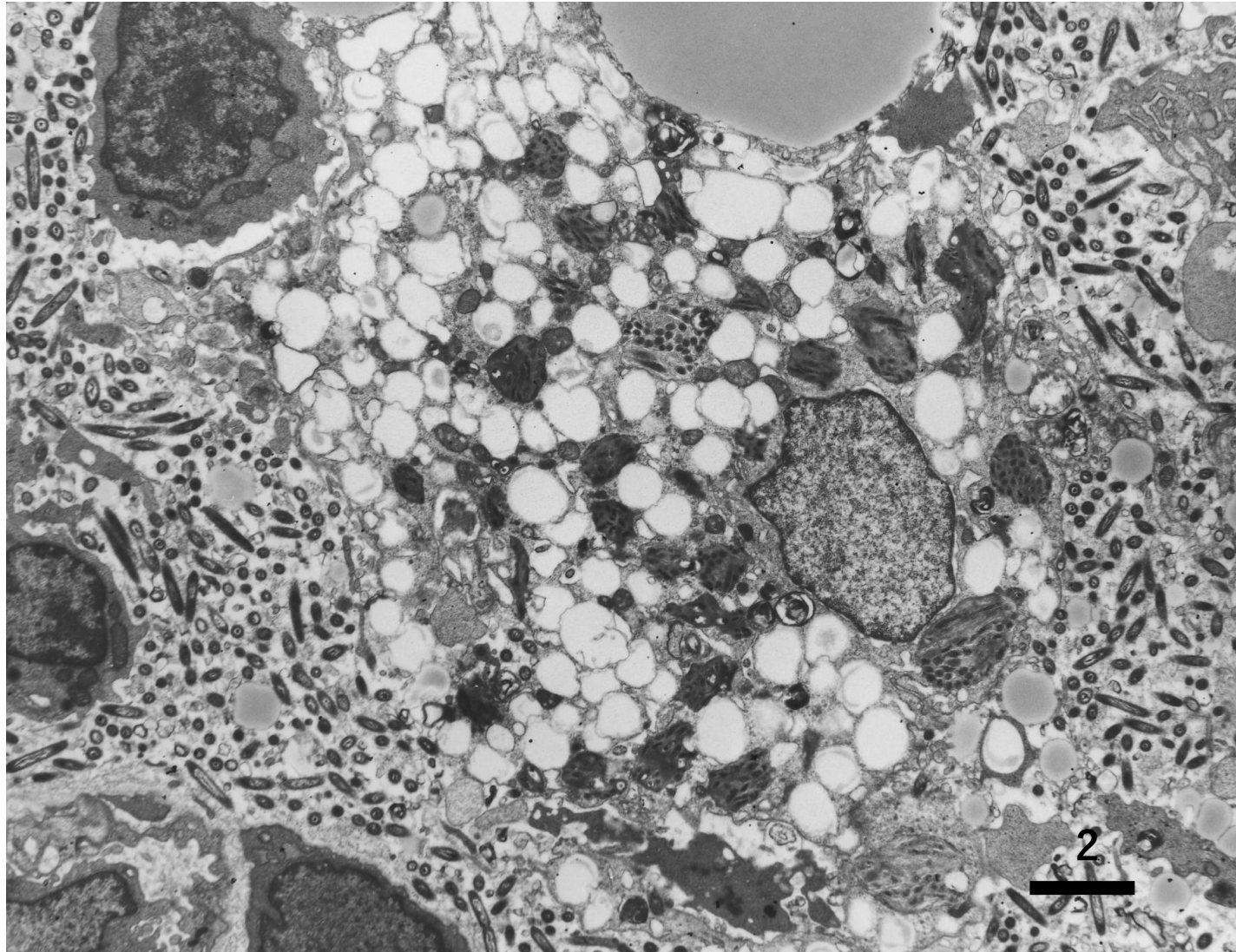
Whipple's disease in a 70-year-old male patient. In the duodenal biopsy, the bacteria growing in the macrophages are strongly positive for *Tropheryma whipplei* antigens. Immunostaining for *Tropheryma whipplei* antigens



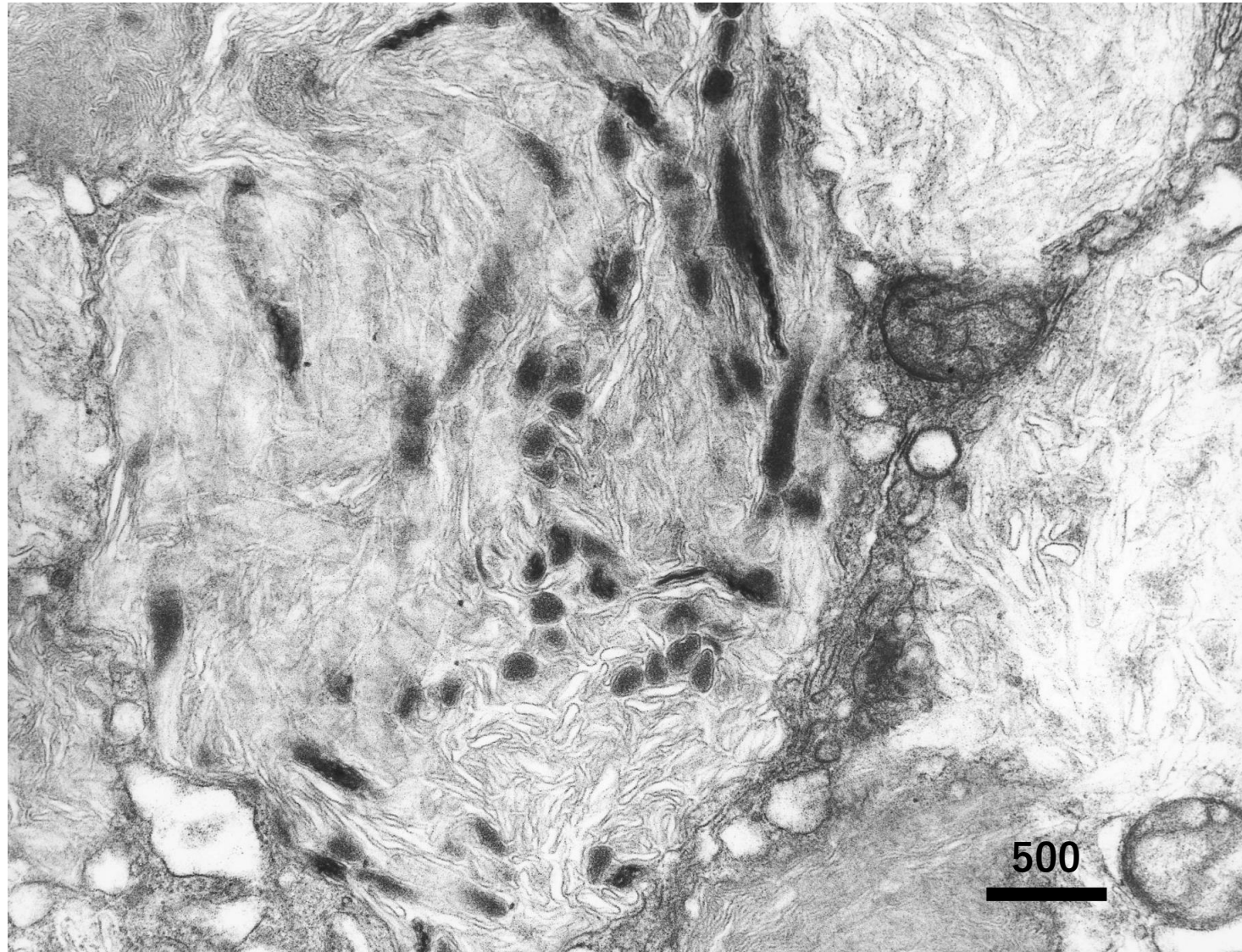
Ultrastructure of Whipple's disease in a 70-year-old male patient. The lamina propria of the duodenal mucosa beneath the columnar epithelium is filled with macrophages with fat droplets and growing bacteria. EM-1



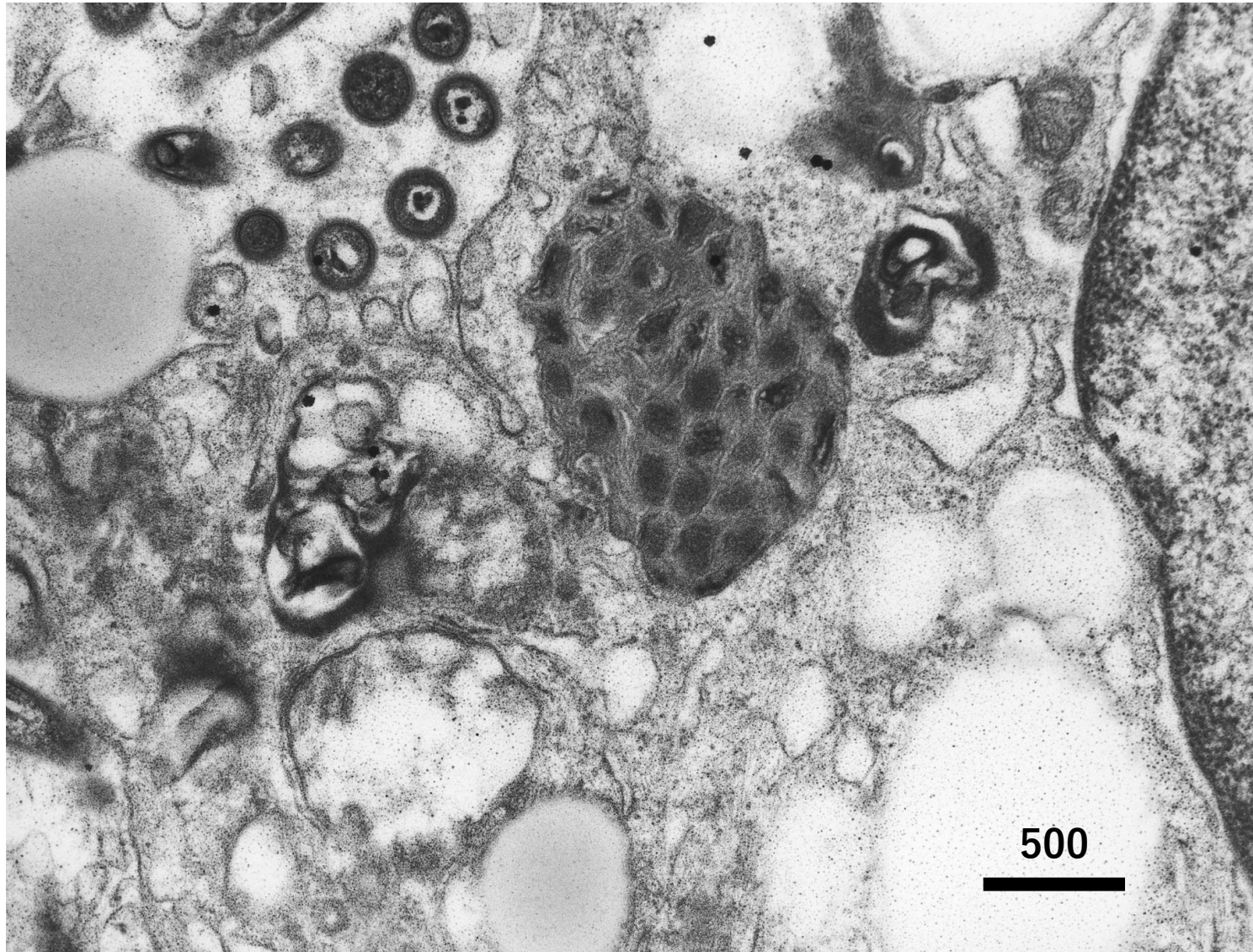
Ultrastructure of Whipple's disease in a 70-year-old male patient. The lamina propria of the duodenal mucosa beneath the columnar epithelium is filled with macrophages with fine fat droplets and growing bacteria. EM-2



Ultrastructure of Whipple's disease in a 70-year-old male patient. Numerous rods are seen outside of the foamy macrophages in lamina propria of the duodenal mucosa. Some rods are phagocytized. EM-3



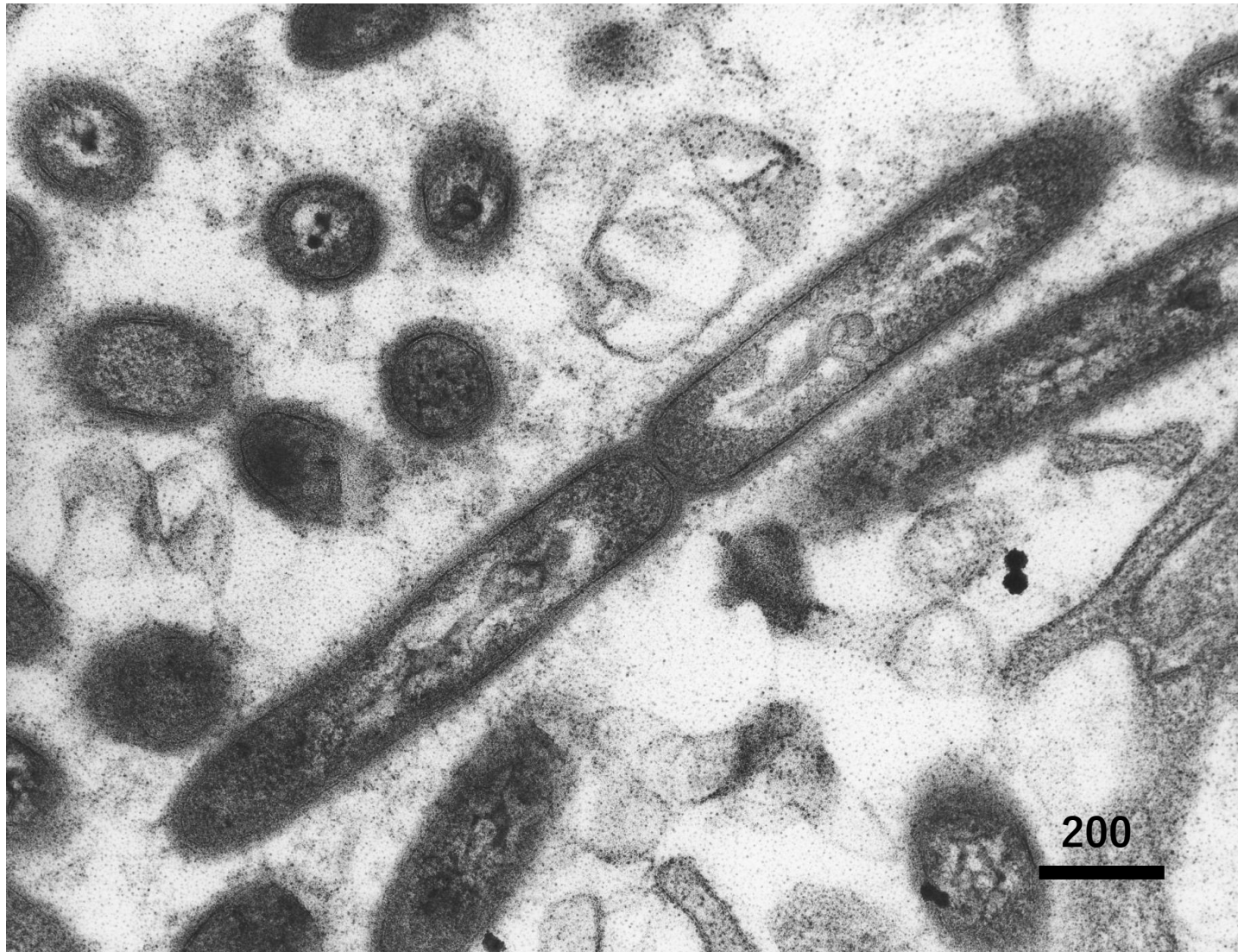
Ultrastructure of Whipple's disease in a 70-year-old male patient. Rods are phagocytized by foamy macrophages in the lamina propria of the duodenal mucosa. The bacteria are seen in the enlarged lysosome. EM-4



Ultrastructure of Whipple's disease in a 70-year-old male patient. Rods are phagocytized by foamy macrophages in the lamina propria of the duodenal mucosa. The bacteria are clustered in the lysosome. The bacteria are also seen outside the cell. EM-5



Ultrastructure of Whipple's disease in a 70-year-old male patient. Rods actively grow outside the cell. EM-6



Ultrastructure of Whipple's disease in a 70-year-old male patient. Rods actively grow outside the cell. EM-7