

Ultrastructural Localization of the Allergen *Der p I* in the Gut of the House Dust Mite *Dermatophagoides pteronyssinus*

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Abstract. The sites and concentrations of *Der p I* within the house dust mite were determined. Highest concentrations were found in the epithelium of the posterior end of the mite stomach, implying that this is the site of *Der p I* synthesis and secretion.

Dermatophagoides pteronyssinus is the commonest mite affecting humans. The mite's major allergen, *Der p I*, is present in fecal particles [1]. Molecular studies indicate that the protein is probably a digestive pro-enzyme [2], and functional studies showed that there was delay in inclusion of labelled fed protein into *Der p I* [3], implying that it was synthesized in the bowel. The present study attempted to specify the sites and concentrations of *Der p I* within the mite.

Mites were immersed in glutaraldehyde, post-fixed in osmium tetroxide, embedded in epoxy resin and consecutive sections cut for optical light and transmission electron microscopy (TEM). For immunocytochemistry, a polyclonal rabbit antiserum against *Der p I* was initially applied to the sections; gold-labelled goat anti-rabbit serum was used as the secondary antibody (probe size 15 nm; Janssen Life Sciences Products). For light microscopy 1- μ m-thick sections were stained in toluidine blue and conventional electron-microscopic sections stained in uranyl acetate and lead citrate.

Scanning electron micrographs of the mite head in a frontal view and of the mite body in a dorsal view are shown in figure 1. Figure 2 illustrates in a low-power longitudinal microscopic section the orientation of the mite gut. Figure 3 is a high-power TEM section demonstrating the detailed histology of the

posterior stomach. This is also depicted in figure 4 where the gold label is indicated by the dots.

Quantification of the allergen/antibody complex was achieved by counting the gold particles in areas of 1 μ m² on TEM micrographs (table 1). The epithelium at the posterior end of the mite stomach, prior to the hindgut, had higher concentrations of *Der p I* than

Table 1. Concentration of allergen/antibody complex in different areas of the posterior mite stomach

Area of stomach	Number of gold particles/ μ m
Epithelial tissue	370 (34)
Epithelium with secretory vesicles	337 (27)
Fecal pellet	203 (19)
Gut lumen	171 (22)

The results are means and SD (in parentheses). Each mean is derived from at least 4 different areas, all 4 results being significantly different (analysis of variance: $p < 0.01$).

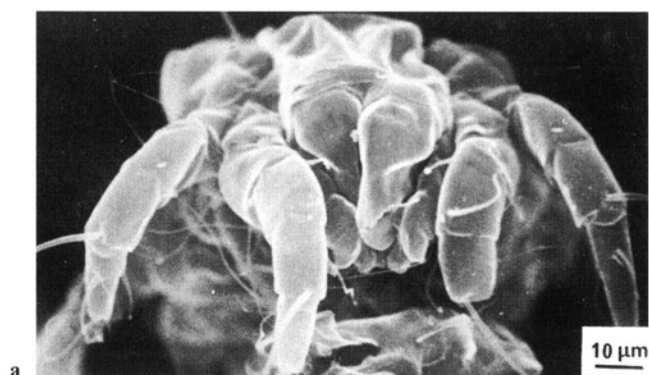


Fig. 1. Scanning electron micrographs of *D. pteronyssinus* in anterior (**a**) and dorsal (**b**) view. Cuticular striations (Cs) of the body cuticle are visible, running laterally and anteroposteriorly over the body surface. On the gnathosoma the chelicerae (Ch) and pedipalps (Vp) are visible. Sensory hairs (Sh) protrude from the ventral surface of the cuticle.

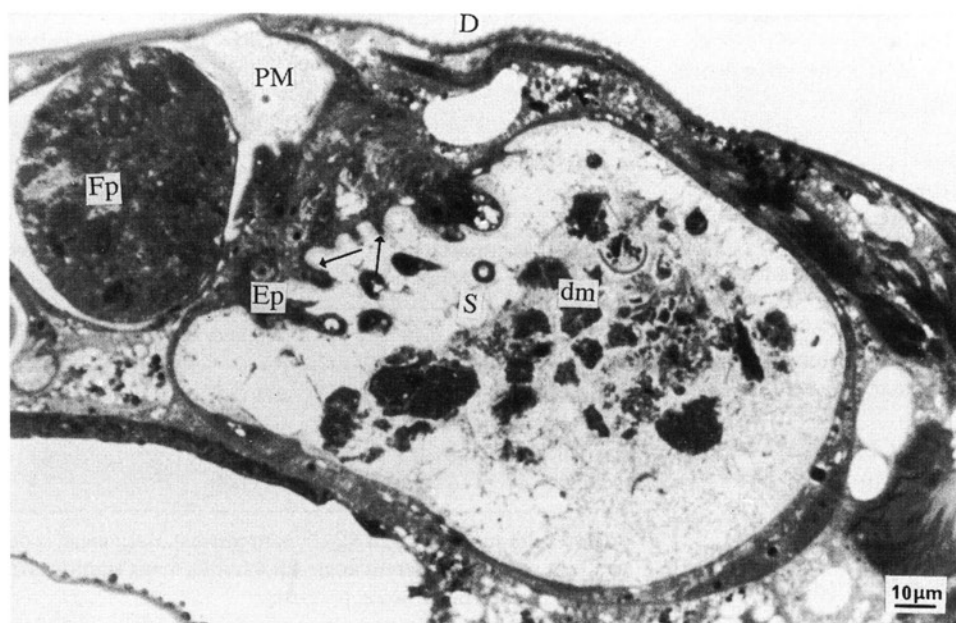
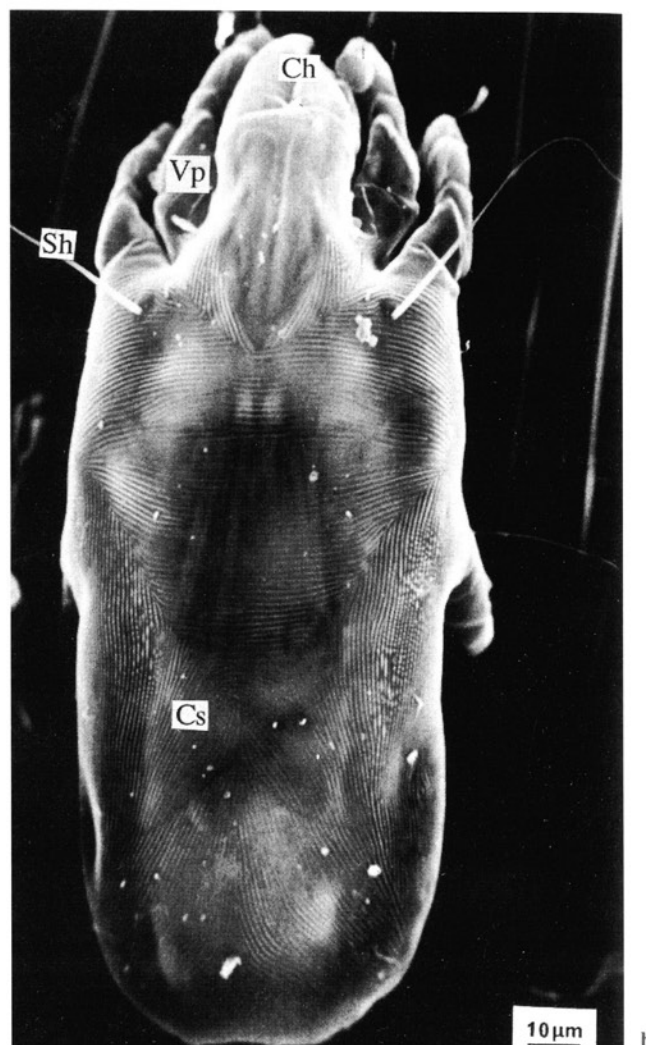


Fig. 2. Optical photomicrograph of a longitudinal section through the mite stomach (S) and posterior midgut (PM). Digestive material (dm) is loose and centrally placed in the stomach. The lining epithelium (Ep) at the posterior end is thick with many folds and projections (arrowed). The epithelium of the posterior midgut shows only slight folds but the digestive material now is round in shape and aggregated to form the beginnings of a fecal pellet (Fp). D = Dorsal surface.



Fig. 3. TEM micrograph from the mite posterior stomach. High concentrations of rough endoplasmic reticulum (RER) in the epithelium suggest synthesis and release of proteins. Small clear vesicles fill the apical regions of these cells and dense-cored vesicles are also present (arrowed). A large filamentous mass in the chamber lumen is evident between the tips of epithelial microvilli (mv) and condensing digestive material (dm) with a thin condensing membrane (Cm).

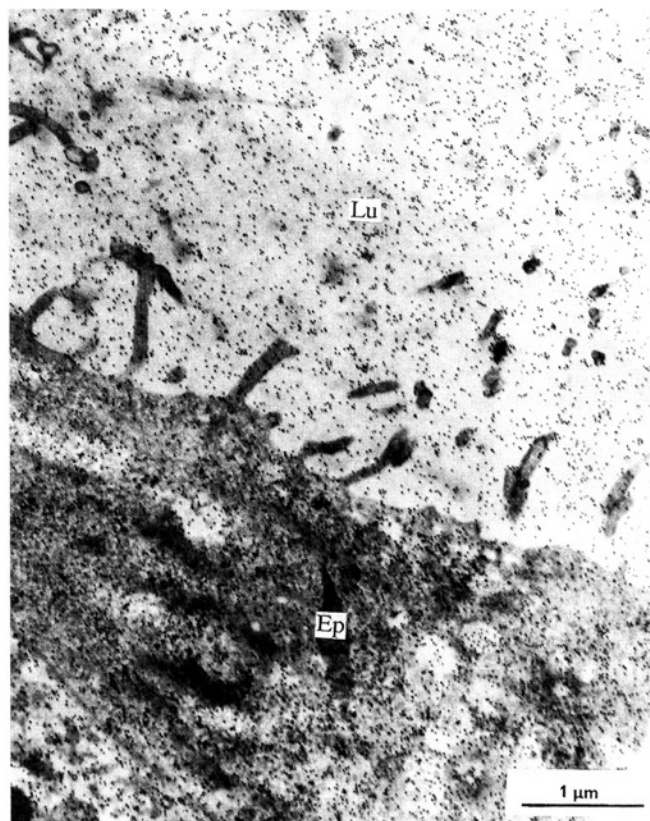


Fig. 4. High-power electron micrograph of the epithelium (Ep) and lumen (Lu) from the posterior stomach after the immunogold staining reaction. Gold complexes appear as black dots.

the epithelium of the central stomach and anterior hindgut; similarly, the luminal *Der p* I concentrations was highest in the posterior midgut, although invariably lower than in the epithelium.

The finding of the highest concentration of *Der p* I in the epithelium of the posterior end of the mite stomach implies that this is the site of *Der p* I synthesis and secretion.

References

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