Electron Microscopy of Tubuloreticular Structures in Allergic Patch Test

Observations with 2,3-Epoxypropyl Trimethyl Ammonium Chloride

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Kanerva L. Electron microscopy of tubuloreticular structures in allergic patch test. Observations with 2,3-epoxypropyl trimethyl ammonium chloride. Acta Derm Venereol (Stockh) 1988; 68: 359–361.

Tubuloreticular structures (TRS) are intracellular tubular inclusions that can be detected by means of electron microscopy. TRS have earlier been found in autoimmune, viral and neoplastic diseases. Here the occurrence of TRS is for the first time described in allergic patch tests, where they were detected in dermal macrophages. TRS are believed to be reaction products of metabolically active cells, and the TRS described here are probably formed as a result of the activation of the immune system in allergic patch tests. *Key words: Allergic contact dermatitis; Glycidyl trimethyl ammonium chloride; Epoxy resin; Macrophage; Immune system; Electron microscopy; Skin.* (Received November 30, 1987.)

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Tubuloreticular structures (TRS) are anastomosing and branching intracellular tubules that have been found in many different types of cells such as lymphoid cells, fibroblasts, endothelial cells and neurons (1–6). TRS have been found in a variety of disorders such as autoimmune, viral and neoplastic diseases (1–3) including the classical and AIDS-associated form of Kaposi's sarcoma (4, 5). TRS resemble unenveloped nucleocapsids of paramyxovirus and were earlier believed to be of viral origin (1). TRS are believed to be complexes of phospholipid membranes and glycoprotein components (7) and have been provoked by ultraviolet light (8), halogenated pyrimidines (9), and leukocyte and fibroblast interferons (10). It is believed that they are reaction products of metabolically active cells. Here the occurrence of TRS is described for the first time in allergic patch test reactions.

PATIENTS AND METHODS

Four patients were diagnosed as having an allergic contact dermatitis from 2,3-epoxypropyl trimethyl ammonium chloride (EPTMAC) (11, 12). Patch testing was performed as previously described (11, 12) and biopsies for electron microscopy were taken from 2 of the patients: from uninvolved skin and at 24, 48 and 96 h from the positive 0.2% and 0.05% (one patient), and 0.2% and 0.1% (the other patient) EPTMAC patch tests. Biopsies were not taken from the other 2 EPTMAC allergic patients. The biopsy samples were processed for electron microscopy by routine techniques after glutaraldehyde fixation (2.5%, pH 7.4) with post-osmification (12).

RESULTS AND DISCUSSION

Clinically the positive allergic patch tests at 0.2% and 0.1% showed erythema, infiltration and/or vesiculation (2+ to 3+), while 0.05% EPTMAC gave a weak allergic reaction (1+) (11, 12). The electron microscopy of the patch test reaction resembled that seen in normal allergic patch tests (13), displaying widened intercellular spaces in the epidermis and a perivascular inflammatory cell infiltrate in the dermis. Altogether four dermal macrophages with TRS were detected in the 48 h and 96 h patch tests (0.2% in pet.) (Fig. 1). TRS were not found in other cells. TRS were formed of loosely intertwining branching and anastomosing

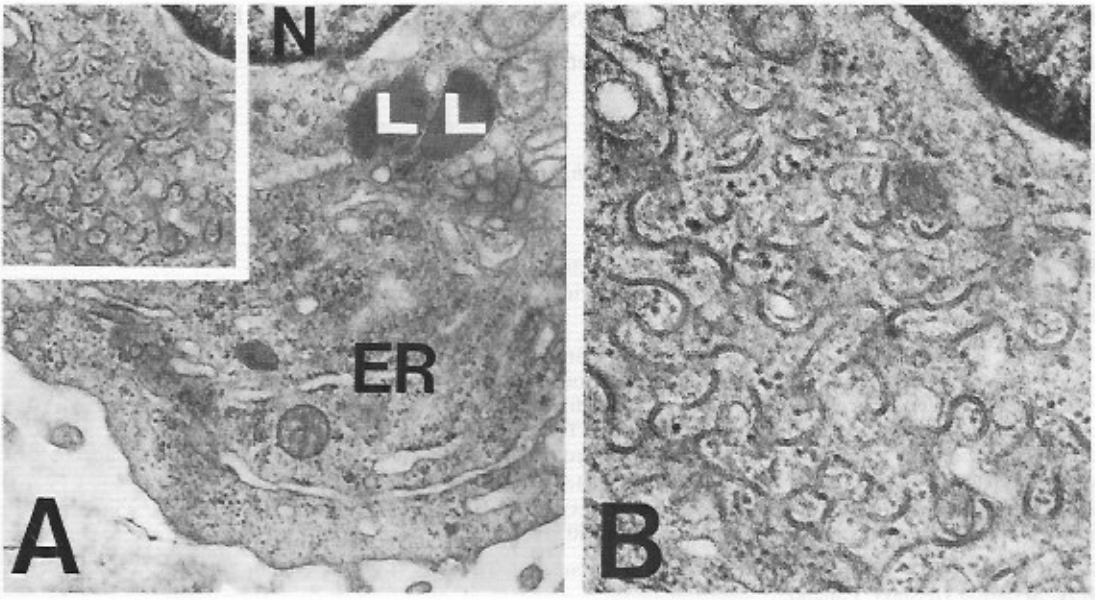

Fig. 1. Macrophage in the dermis of allergic patch test at 96 h. *Inset:* (*A*) shows the tubuloreticular structures, which are seen at higher magnification in (*B*). *N*, nucleus; *L*, lysosome; *ER*, endoplasmic reticulum. *A*, ×20 800; *B*, ×43 200.

tubuli 20–30 nm in diameter adjacent to the endoplasmic reticulum, corresponding to the TRS morphology previously described (1–6).

EPTMAC is a quaternary ammonium compound containing an epoxide group (11). EPTMAC is a sensitizer and, like other quaternary ammonium compounds has also a skin irritant effect (11). However, the present author does not believe that TRS would be induced by this compound only, and not by other allergens. In electron microscopy, often only those organelles specifically looked for are detected. It is probable that TRS have been present but not found during earlier studies on delayed hypersensitivity reactions.

The patients were otherwise healthy and did not show during patch testing signs of, say, viral infection, although TRS were earlier believed to be of viral origin. The present finding indicates that activation of the immune system in delayed hypersensitivity reactions is one stimulus for TRS to develop in immunocompetent cells. TRS have not been detected in exocytic immunocompetent cells or Langerhans cells in the epidermis in allergic patch tests.

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Patch Testing with Nickel Sulphate under Occlusion for Five Hours

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Routine patch testing is usually performed with the allergens under occlusion for 48 h, but a shorter occlusion time would of course be more convenient for the patient. In this study, nickel was chosen as the substance with which to investigate whether routine patch testing with allergen exposure for 5 h is possible. Patch testing, using dilutions of nickel sulphate under occlusion for 48 h and 5 h, was compared in 8 nickel-sensitive females. The results show that equivalent patch test reactions were achieved when using higher concentrations of the nickel solutions under occlusion for 5 h. *Key words: Allergic contact dermatitis; Delayed hypersensitivity; Patch test technique.* (Received October 22, 1987.)

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The patch test technique has some disadvantages, one of which is the inconvenience for the patient, who has to wear the patch test on the back for 48 h. The purpose of this study was to investigate whether it is possible to use a shorter occlusion time, such as 5 h, which for most patients would permit the removal of the test patch before bed-time.

MATERIAL AND METHODS

Eight females with previous positive allergic patch test reactions to the standard patch test preparation with nickel (nickel sulphate in petr. 5% w/w) participated voluntarily in further patch tests with nickel solutions.