

## Intracytoplasmic Crystalline Inclusions in Dermal Infiltrating Cells of Granulomatous Contact Dermatitis due to Gold Earrings

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A case of granulomatous contact dermatitis due to gold earrings for pierced ears was studied ultrastructurally. The patient was a 24-year-old woman, who had reddish brown papules on the earlobes. Patch test using gold sodium thiomalate proved strong positive, with blister formation. Histological observation of the papule showed dense cell infiltration throughout the full thickness of the dermis. Ultrastructurally, dermal infiltrating cells consisted of lymphocytes and histiocytes. Unusual crystalline inclusion bodies were observed in the cytoplasm of these cells. These structures were elliptical, not encapsulated and showed a regular fingerprint-like pattern of parallel lines along the short axis. The width of the lines and their intervals was 12 nm. These findings suggest that continuous contact between gold and dermis may induce inflammation, causing granulomatous changes and the development of crystalline inclusion bodies. (Received June 1, 1987.)

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Contact dermatitis induced by gold is rare, due to the insolubility of the metal (1). However, there are occasional instances of granulomatous contact dermatitis in those who wear gold earrings in pierced ears, and it has been suggested that ear piercing and wearing of earrings create a condition in which the dermis is in close contact with the metal (2). Iwatsuki et al. (3) reported electron microscopic findings in such lesions.

We encountered a patient with typical granulomatous contact dermatitis due to gold pierced earrings, and observed by electron microscopy unusual structures in the cytoplasm of dermal infiltrating cells.

### MATERIAL AND METHODS

The patient was a 24-year-old woman who had holes pierced bilaterally in her earlobes and began to wear 18-carat gold earrings, which contained 75% gold, copper, silver and tin, about half a year before the examination. Three weeks later she noted an itchy eruption consisting of erythema and swelling at the sites. Although the symptoms subsided slightly in response to medical treatment such as topical application and intralesional injection of corticosteroid, they persisted, with repeated periods of exacerbation.

Reddish brown papules 3 mm in diameter were observed at the anterior and posterior opening of each hole in the earlobes. There was scaling around the papules (Fig. 1). The lesions were elastic, soft, not wet, and caused mild itching.

Patch testing was performed using gold sodium thiomalate (Shiosol) for injection. The reaction was strongly positive with blistering when 1.5 mg/cm<sup>2</sup> of the agent was applied. With 0.74 and 0.37 mg/cm<sup>2</sup> of gold sodium thiomalate, the reaction was moderately positive with blistering around the site of application after 48 h, and at the site of application after 96 h. Mild induration was noted at the site for more than 1 month after patch test.

The lesion in an earlobe was biopsied under minimal lidocaine anesthesia for histological and electron microscopic examination. The specimens for electron microscopy were fixed for 2 h in buffered 2% glutaraldehyde with phosphate and, after being rinsed in the same buffer, post-fixed in 1% osmium tetroxide for 90 min. After fixation, the specimens were dehydrated in ethanol and embedded in Spurr. Thin sections were cut with glass knives on a Porter-Blum ultramicrotome, and

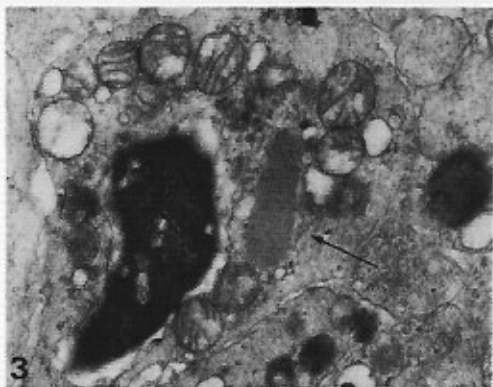
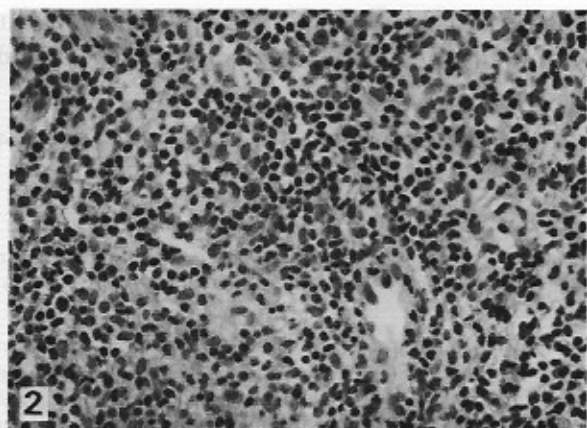


Fig. 1. A reddish brown papule on the earlobe.

Fig. 2. The infiltrating cells consisting of lymphocyte-like cells and histiocytes.

Fig. 3. Crystalline inclusion bodies in the cytoplasm of infiltrating cell (arrow).  $\times 12\,600$

after being mounted on a grid with Formvar, were stained with uranyl acetate and lead citrate. Pictures were taken with a HS-9 Hitachi electron microscope.

## RESULTS

### Histopathological findings

Dense cell infiltration was observed throughout the full thickness of the dermis. The infiltrating cells consisted of two types of cells. One was lymphocyte-like cells with an intensely stained nucleus and small cytoplasm, and the other was larger cells with an elliptical, weakly stained nucleus and large cytoplasm (Fig. 2). No plasma cells were observed. The epidermis appeared normal.

### Electron microscopic findings

Dermal infiltrating cells comprised lymphocytes and histiocytes. The former had rich heterochromatin areas, a circular or slightly indented nucleus with 1 to 2 nucleoli, small cytoplasm, and a few organelles. The latter had rich cytoplasm, a generally circular nucleus with a few heterochromatin areas and light nucleoplasm, and rich cytoplasm with well developed intracytoplasmic organelles such as mitochondria, Golgi apparatus and endoplasmic reticulum.

Crystalline inclusion bodies were occasionally observed in the cytoplasm of lymphocytes and histiocytes. Measurements were made with a ruler on copies of micrographs at a

magnification of  $\times 50\,000$ . They were elliptical, not encapsulated, and  $0.4\text{--}0.7\ \mu\text{m} \times 1.2\text{--}1.5\ \mu\text{m}$  in diameter. A regular fingerprint-like pattern of parallel lines was observed along the short axis in their interior, and the width of the lines and their intervals was 12 nm (Fig. 3, arrow). No crossing of the lines or honeycomb structure was noted.

## DISCUSSION

Over the past 20 years, several cases of papular (dermal) reaction to gold have been reported (1–6), especially in women with pierced ears and wearing gold earrings. In our patient, dermal infiltrating cells, detected by light and electron microscopy, consisted mainly of lymphocytes and histiocytes, with the occasional presence of mast cells. Similar findings were reported by Young (1), but other authors (2, 3) have described such cells as lymphocytes and plasma cells. Peculiar crystalline inclusion bodies were found in the cytoplasm of infiltrating cells. Identical structures have been observed in the infiltrating cells of hyperkeratosis lenticularis perstans (7), actinic reticuloid (8) and pseudo-mycosis-fungoides (9).

Moreover, similar structures have been found in neoplastic cells of chronic lymphocytic leukemia (10), T and B lymphocytes, and plasma cell in multiple myeloma (11), lymphoid cells of a human renal allograft (12), fibroblasts treated with alkaloids (13), and hepatocytes of alcoholics (14, 15), patients with drug hepatotoxicity (15) and even in normal individuals (16). These structures varied from lattices (13, 16), of tubular appearance (13), rectangular crystals with periodic arrangement (10), herring bone appearance (15), longitudinal striation (11), parallel pattern (12), to a honeycomb structure (15). However, these patterns differ from our crystalline inclusion bodies.

It has been speculated that such structures as seen in our study might have formed as a result of polymerization of substances such as phospholipid and/or protein (14), phospholipid micelles or large protein molecules (17), unreleased monoclonal macroglobulin (10), or other unidentified material (16).

In our patient, the patch test using gold sodium thiomalate induced erythema and blistering, with peripheral blister formation being observed at a low concentration. This phenomenon seems to be the result of a higher concentration of the test solution around the site of the application than in the central area. Or this finding might be an 'edge effect' which is an irritant reaction (18).

We did not perform patch tests for copper, silver or tin, which were present in the 18-carat gold earrings; thus, the possibility of cross-reaction with other metals is not excluded.

It is supposed that gold earrings penetrate the earlobe, bring gold into continuous contact with the dermis, and inflammation secondary to hypersensitivity reaction to gold may modify the reaction, causing granulomatous changes and the formation of the above crystalline structures in the infiltrating cells.

## ACKNOWLEDGEMENTS

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### Benign Cephalic Histiocytosis

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Ayala F, Balato N, Iandoli R, Donofrio V, De Rosa G. Benign cephalic histiocytosis. *Acta Derm Venereol (Stockh)* 1988; 68: 264-266.

A case of benign cephalic histiocytosis in a 18-month-old male child is reported. Characteristic distribution of the maculo-papular lesions on the cheeks, forehead and earlobes, in addition to light and electron microscopical findings permitted the diagnosis of this rare disorder. Ultrastructurally, worm-like and comma-shaped bodies were seen in the cytoplasm of the histiocytes infiltrating the upper dermis. *Key word: Pediatric dermatology.* (Received September 17, 1987.)

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Benign cephalic histiocytosis (BCH) was first described by Gianotti et al. (1) in 1971 as "Juvenile histiocytosis with intracytoplasmic worm-like particles". Subsequently, other authors reported several cases of this rare entity (2-6), that is actually known as BCH