

Short reports

Occupational asthma after exposure to a diazonium salt

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Asthma after exposure to reactive dyes is an important cause of occupational lung disease. We recently investigated a patient with asthma shown to follow exposure to diazonium chlorides used in the manufacture of photocopy paper.

Case report

The patient, a 49-year-old Caucasian man presented with five-month history of wheeze and urticaria. He had been employed for one year by a firm that makes photocopy paper using a dye-coupling reaction.¹ Although he had worked in all departments his main work was as a mixer, weighing and mixing powders including diazonium chlorides. His symptoms began suddenly two days after his return to the mixing department having previously worked there for a few weeks uneventfully. At this time the department was undergoing alteration and fewer dust extractor hoods were in use than usual. The patient's wheeze persisted for 10 days and was particularly troublesome at night and after exertion. He then returned to work in a different part of the factory, but again developed asthma a few hours after he had walked through the mixing department. This attack required treatment

with oral corticosteroids.

His history showed that he had been asthmatic for three months in 1959 while serving with the army in Singapore but had had no recurrence until the present episode. There was a family history of atopic disease, his sister having asthma and his daughter eczema and hay fever. He was a heavy cigarette smoker but had given this up when his asthma recurred.

On examination these were no abnormal findings. Chest radiograph was normal. Respiratory function tests showed evidence of mild reversible airflow obstruction. A positive exercise test and histamine bronchial provocation confirmed the diagnosis of asthma. The patient was atopic, 21 out of 23 skin prick tests to common allergens being positive and total serum IgE being raised to 650 IU/ml⁻¹ (normal range < 100 IU ml⁻¹). Sputum eosinophilia was present but no excess blood eosinophilia was demonstrated.

The patient was admitted to hospital for further investigations. Peak expiratory flow rate (PEFR) using a Wright peak flow meter was measured hourly through each day and more frequently immediately after bronchial challenge. Measurements of respiratory function during control days showed the presence of early morning dipping. Bronchial provocation was carried out in a challenge chamber using lactose BPC as a control dust and 100 mg of diazonium chloride mixture in 500 g of lactose as the test dust. The patient tipped the dust from

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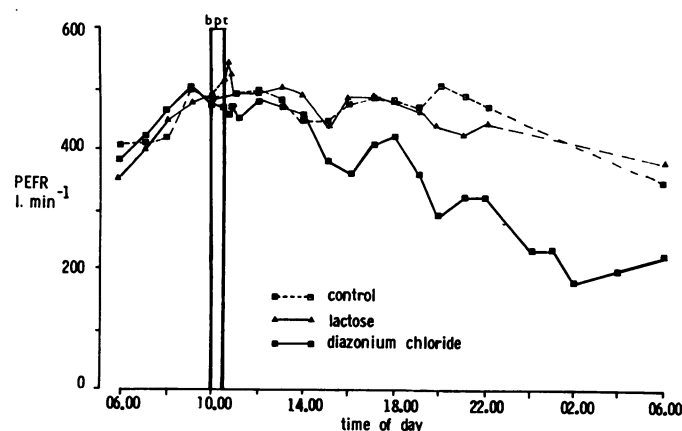


Fig 1 A bronchial provocation test with lactose and diazonium chloride showing the development of a late asthmatic reaction. bpt = bronchial provocation test.

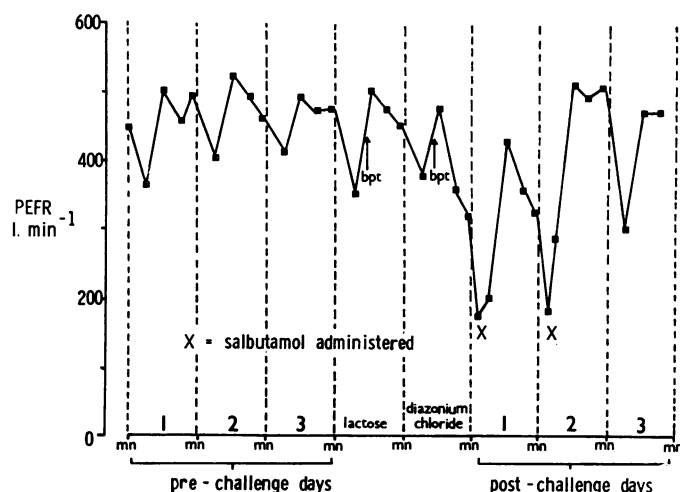


Fig 2 Pre- and post-challenge days of a bronchial provocation test with diazonium chloride showing early morning dipping during control days and recurrent asthma after exposure to diazonium chloride. bpt = brachial provocation test.

one container into another for 30 minutes at the same time of day on each test day. Figure 1 shows values of PEFR at different times during a control day and the two days when the patient underwent bronchial challenge. It can be seen that there is a marked delayed fall in PEFR starting four hours after challenge with diazonium chloride whereas the PEFR after lactose challenge closely follows the control day values. Figure 2 shows PEFR measured four times a day before, during, and after bronchial challenge. A recurrent asthmatic pattern is seen after challenge with diazonium chloride as shown by an exaggerated fall in early morning PEFR over the next three days.

Discussion

Diazonium salts used in photoreproduction are light sensitive compounds which require a reaction such as dye-coupling to result in permanent image; an azo-dye is formed usually as a result of coupling. Diazonium compounds are widely used throughout the world both in photocopying and in the dye industry. In this country there are six companies making photocopy materials using these compounds in addition to firms that make diazonium salts or use them in the manufacture of dyes.

Although there is one report from Italy² on an association of asthma and exposure to diazonium compounds it has never been previously reported in the English literature; furthermore, these studies were based entirely on clinical history without measurement of respiratory

function before or after bronchial provocation tests or occupational exposure.

Alanko *et al.*³ described four cases of immediate asthma and rhinitis caused by reactive dyes which included Cibachrome brilliant scarlet 3R, Levafix brilliant yellow E-36 and Drimaren brilliant blue K-BL. These dyes differ from diazonium salts in that they contain an azo or anthraquinone group instead of a diazo group. They are extensively used in industry because of their bright colours and firm chemical fixation to cellulose, protein and polyamide fibres. The authors found a high serum level of specific IgE in three of these patients. Our patient differs, however, in that he developed late and recurrent asthma after exposure to diazonium chloride, a compound used in the manufacture of some of these dyes. We were unable to demonstrate a high serum level of specific IgE using the method of Alanko *et al.*³ This may have been caused by the highly reactive properties of diazonium compounds and their tendency to decompose on exposure to heat, light, and water, making it difficult to prepare the appropriate protein hapten conjugate for the radioallergosorbent test.

References

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- 3 Alanko K, Keskinen H, Björkstén F, Ojanen S. Immediate-type hypersensitivity to reactive dyes. *Clin Allergy* 1978; 8:25-31.