

Asthma induced by ivory dust: a new occupational cause

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ABSTRACT A case of asthma is reported that was due to ivory from the tusk of the elephant, a cause of occupational asthma unique to Africa.

There are many causes of occupational asthma.¹ In Africa unique causes that have been reported are buckwheat² and Kejaat wood,³ and we now present a patient with asthma due to ivory.

Case report

The patient, a 26 year old non-smoking black Zimbabwean man, presented nine months after starting work in an ivory carving workshop with a six month history of breathlessness. He had been given emergency treatment for acute asthma on two occasions. He was a silver worker, employed in an environment heavily contaminated with ivory dust. He worked with silver alloy (silver 97%, copper 2%, manganese

1%) and flux, which was a borax solution. He had had no respiratory problems while working previously with silver in a non-ivory containing environment.

To assess the relationship of his symptoms to his work, his respiratory function, determined as forced expiratory volume in one second and forced vital capacity (FEV₁ and FVC), was first allowed to stabilise away from his work. His FEV₁ was then measured twice daily over a week while he was in his normal work environment and on a second occasion after a further period away from work (fig 1).

The patient was also studied in the laboratory. On three consecutive days he received 30 minutes' exposure to lactose, the silver alloy and flux he worked with, and ivory dust. The lactose and ivory dust were administered by the pouring method described by Pepys.⁴ After each exposure the FEV₁ was measured four hourly for 24 hours. The ivory exposure was repeated after 48 hours of sodium cromoglycate treatment (fig 2).

Total IgE was 934 kU/l (for non-atopic patients geometric mean is 41 (SD 14) kU/l (Pharmacia Diagnostica)). Specific IgE to ivory measured with a radioallergosorbent test (RAST) was not detected. Investigation of stool, urine and

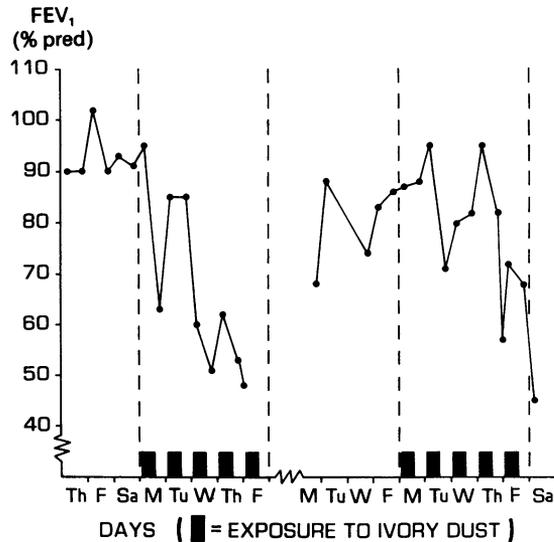


Fig 1 Percentage change in FEV₁ after two periods of exposure at work.

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Accepted 24 December 1987

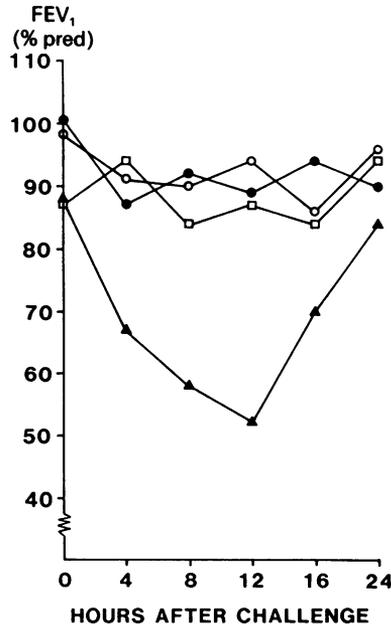


Fig 2 Percentage change in FEV₁ after bronchial challenge in the laboratory. ● Lactose; ○ silver and flux; ▲ ivory; □ ivory after sodium cromoglycate.

blood disclosed no cause for the raised IgE. There was no peripheral eosinophilia.

A skinprick test with solutions of ivory extract in Coca's solution in concentrations of 1:5000–1:50 000 of a 1% solution showed no reaction at 10 minutes or at 4 hours.

Ten other non-smoking workers at the ivory workshop underwent spirometry during the period of the patient's testing at work. Nine had normal function. The tenth had a restrictive defect consistent with a past history of tuberculosis.

Gravimetric analysis showed the dust concentrations in the workshop to range from 5 to 12 mg/m³. This is above the recommended concentration for nuisance dust (National Institute of Occupational Safety and Hygiene).

Discussion

The patient showed a definite fall in FEV₁ while at work below the level when he was away from work. Laboratory studies showed a clear relation between this fall and his exposure to ivory dust but not to lactose powder or to silver alloy and flux.

Our methods could be criticised in that testing was not done immediately after exposure. This was because the pattern of response at work appeared to be a late reaction. A possible early response may therefore have been missed.

Ivory is obtained from the tusk of the African elephant, *Loxodonta africana*, and is composed of dentine, which consists of 18% collagen, 70% hydroxyapatite crystals, and 10% water.⁵ If the pathophysiological basis of the patient's

asthma is immunological, the most likely reaction would be to the collagen in the ivory.

RAST and skin tests did not produce evidence of an immunological reaction to ivory in this patient; but it is recognised that RAST and skin tests may give negative results in patients with a positive response to a bronchial allergen challenge.⁶ The inhibition by sodium cromoglycate of the reaction to ivory dust suggests an immunological basis, possibly of the type 1, mast cell mediated variety.

We would like to thank Dr R J Davies of the department of respiratory medicine, St Bartholomew's Hospital, London, for his help and advice and for measurement of IgE and RAST levels.

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