Estimated mean effect on linear analogue scores (adjusted for mean daily temperature and humidity) of high negative ion concentrations

	Estimated centre	95% Confidence interval
Environment:		
Hot/cold	−1·0	−4·7 to 3·1
Pleasant/unpleasant	−0·6	−5·1 to 6·1
Fresh/stuffy	−2·0	−6·2 to 3·2
Comfortable/uncomfortable	−0·9	−5·4 to 5·8
Personal:		
Hot/cold	−0·9	−5·7 to 4·0
Comfortable/uncomfortable	−3·2	−7·2 to 2·6
Pleased/annoyed	−1·9	−6·6 to 3·8
Alert/drowsy	−1·0	−5·7 to 5·2
Best/worst	−1·7	−6·0 to 3·6

high negative ion periods for each subject were obtained, and that of the low ion period was subtracted from that of the high ion period to produce a representative figure for each subject. The 95% confidence interval for these figures was calculated and for all symptoms except two (upper respiratory tract infections and nausea in the high negative ion period) included zero.

Comment

The sick building syndrome is well known among office workers and is becoming more recognised among health workers.[1] It is therefore important to be able to give correct advice when faced with this problem. This study provides evidence that negative ion generators are not to be recommended for this problem, especially as the data on temperature and humidity provided a good "internal control" that real effects were being measured.

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1 Finnegan MJ, Pickering CAC, Burge PS. Sick building syndrome: prevalence studies. *Br Med J* 1984;289:1573-5.
2 Hawkins LH. The influence of air ions, temperature and humidity on subjective wellbeing and comfort. *Journal of Environmental Psychology* 1981;1:279-92.
3 Hawkins LH, Morris L. Air ions and the sick building syndrome. In: Berglund B, Lindvall T, Sundell J, eds. *Proceedings of the third international conference on indoor air quality and climate.* Vol 1. *Recent advances in health sciences and technology.* Stockholm: Swedish Council for Building Research, 1984:197-200.
4 Laws CA. Air ions in the working environment. *Heating and Ventilating Engineer* 1982;May:18-20.
5 American National Standards Institute, American Society of Heating Refrigerating and Air conditioning engineers, and Illuminating Engineers Society of North America. *Energy conservation in new building design.* New York. ANSI, 1980:90A.

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Subunit influenza vaccination in adults with asthma: effect on clinical state, airway reactivity, and antibody response

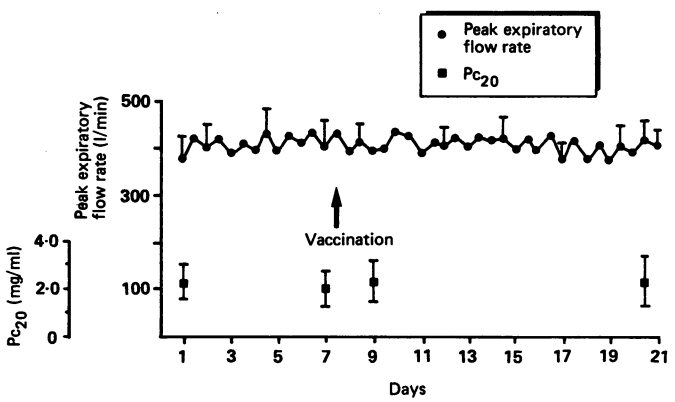
The Chief Medical Officer recommends an annual influenza vaccination for patients with chronic pulmonary disease including asthma. Some doctors may be reluctant to vaccinate asthmatic patients because of the risk of inducing increased bronchial reactivity[1] and exacerbating their patients' asthma. Reactions to these vaccines may be due to non-immunogenic impurities, which are not present in the more recently developed subunit vaccines. In subunit vaccines the surface antigens are separated from the virus core by selective solubilisation.[2] These vaccines cause fewer side effects when given to normal subjects.[3] We therefore studied the effect of one dose of a subunit vaccine on airway reactivity, symptoms, and peak flow rate in patients with chronic stable asthma and measured the antibody response in these patients.

Patients, methods, and results

Fourteen asthmatic patients (12 men and two women) with a mean age of 44 years (range 24-65) were studied. All patients were non-smokers. Eight patients had had asthma since childhood, and 11 were atopic as judged by results of skin prick tests, although none was allergic to eggs. These patients had moderately severe asthma with daily symptoms and a mean forced expiratory volume in one second when stable of 74% of predicted values. All the patients required regular daily treatment with inhaled β_2 agonists, and 11 also required regular inhaled corticosteroids. Two patients were taking theophylline, and one was taking cromoglycate.

Baseline spirometry and histamine challenge tests were performed on all patients.[4] They were then asked to record their peak expiratory flow rates every morning and evening, complete daily symptom score charts (morning tightness, daytime asthma, cough, and night asthma), and record their use of bronchodilator drugs for one week. After a second set of baseline lung function measurements, histamine challenge tests, and baseline serology had been performed the patients were vaccinated with 0·5 ml of subcutaneous Influvac subunit (Duphar Laboratories Ltd) containing the following: influenza A/Philippines/2/82 (H3N2) 10 μg HA; influenza A/Brazil/11/78 (H1N1) 10 μg HA; and influenza B/Singapore/22/79 10 μg HA. The lung function measurements and histamine challenge tests were repeated two days and two weeks after vaccination at the same time of day. Antibody titres were also measured again two weeks after vaccination using complement fixation tests to monitor natural infection and a radial haemolysis test to detect vaccine induced antibodies to viral surface antigens.[5]

None of the patients experienced any local or systemic side effects after vaccination, and there were no significant changes in symptoms of asthma, use of bronchodilator drugs, or peak expiratory flow rates (Student's *t* test). There were also no significant changes in lung function measurements and results of histamine challenge tests either during the week before vaccination or two days and two weeks after vaccination (figure).



Changes in peak expiratory flow rate and histamine concentration required to cause a 20% fall in forced expiratory volume in one second (PC_{20}) during the study. Values are means and standard error of mean.

Results of complement fixation tests showed no evidence of natural infection with either influenza A or influenza B. Substantial antibody responses to vaccine were shown by radial haemolysis in all patients[5]: eight responded to all three vaccine components; four responded to two components; and the remaining two patients responded to only one of the strains.

Comment

In this study subunit influenza vaccination was well tolerated by a group of patients with moderately severe asthma. Substantial antibody responses were noted in all patients to at least one of the components of the vaccine. Removal of the virus core from the vaccine therefore seems to reduce the local and systemic side effects of vaccination while maintaining the immunogenic properties of the vaccine.

In seven of the asthmatic patients results of skin prick tests to feather antigen were positive, but none of them experienced any reactions after vaccination. Since there is no evidence to suggest that a positive result in a skin prick test to a feather antigen is a contraindication to influenza vaccination we believe that this recommendation should be revised.

This study was not intended to determine whether or not subunit vaccine provides adequate protection against influenza infection in asthmatic patients. Such an investigation would require a large scale study, preferably

during an influenza epidemic. We have shown, however, that subunit vaccine is well tolerated by asthmatic patients and is immunogenic.

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1 Oulette JJ, Reed CE. Increased response of asthmatic subjects to methacholine after influenza vaccine. *J Allergy* 1965;**36**:558-63.
2 Bachmayer H. Selective solubilisation of haemagglutinin and neuraminidase from influenza viruses. *Intervirology* 1975;5:260-8.
3 Barry DW, Mayner RE, Hockstein HD, *et al*. Comparative trial of influenza vaccines. II. Adverse reactions in children and adults. *Am J Epidemiol* 1976;**104**:47-59.
4 Cockcroft DW, Killian DN, Mellon JJ, Hargreave FE. Bronchial reactivity to inhaled histamine: a method and clinical survey. *Clin Allergy* 1977;7:235-43.
5 Grilli EA, Smith AJ. The use of a radial haemolysis test for neuraminidase antibodies in the diagnosis of influenza A infection. *J Hyg (Camb)* 1983;**91**:147-56.

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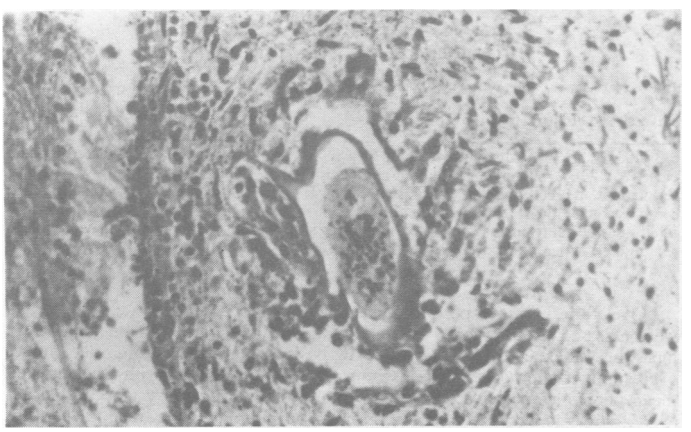
Acute mesenteric ischaemia caused by Schistosoma mansoni infection

Symptoms of the three types of schistosomiasis reflect the particular venous system infested by the parasitic ova. Infestation of the pelvic vein explains the bladder and rectal symptoms of schistosomiasis haematobia, schistosomiasis mansoni, which is prevalent in north east Africa and parts of the Middle East, predominantly affects the inferior mesenteric vein, and the oriental parasite *Schistosoma japonicum* has a predilection for the superior mesenteric vein and is therefore most likely to affect the small intestine. Intestinal obstruction may result from an intussuscepting polypoid mass or from fibrotic stenosis of the lower wall.[1]

We report a rare case of infestation with *S mansoni*, in which mesenteric venous occlusion led to acute obstruction and infarction of the jejunum.

Case report

A 35 year old Egyptian man presented to Yarmouk Hospital, Baghdad, in June 1985 with the clinical and radiological features of high small bowel obstruction. The absence of bowel sounds, tachycardia (115 beats/min), and abdominal tenderness suggested a diagnosis of strangulation. He was dehydrated and had a blood pressure of 90/60 mm Hg. Five years earlier he had undergone splenectomy for Egyptian (schistosomal) splenomegaly. In addition, he was found to have iron deficiency anaemia (haemoglobin concentration 11·2 g/l). After nasogastric intubation and fluid replacement (including 1 unit of blood) laparotomy was performed through a paramedian incision. There were some 3 litres of haemorrhagic ascites and a gangrenous segment of jejunum 76 cm long. There was a clear cut line of demarcation between the viable and non-viable bowel but no constriction ring and nothing to suggest previous entrapment of the loop. Thrombosis was observed in the small mesenteric veins draining the affected segment, but the major mesenteric and splenic veins were all patent. The liver and colon seemed normal.



Schistosoma mansoni ovum.

After resection of the gangrenous small bowel with end to end anastomosis the patient recovered and was discharged home 12 days later. Histological examination showed thrombosis of medium sized mesenteric veins and arteries, which contained numerous ova of *S mansoni* type. There was coagulative necrosis of the resected bowel but no evidence of arteritis or any other underlying cause for vascular occlusion.

Comment

The pathological lesions of schistosomiasis result from the deposition of a large number of live ova in the serosal and submucosal layers of the intestine. Enzymatic digestion of the tissues provokes a chronic inflammatory response, characterised by ulceration and thickening of the mucosa, which may accumulate to form polyps.[2,3] Symptoms include abdominal colic, diarrhoea, rectal passage of blood and mucus, and allergy like reactions, such as fever and urticaria. Though children may develop acute dysentery, emergency presentation is unusual in adults. We are not aware of any reports of acute mesenteric ischaemia as a complication of schistosomiasis. Nevertheless, our patient showed no evidence of any other condition known to be associated with mesenteric ischaemia secondary to occlusive disease of the small vessels, in particular atherosclerosis, Buerger's disease, embolism, and autoimmune disease. Vasculitis was excluded by the histological findings, and there was no relevant drug history.[4,5] The finding of many parasitic ova in the thrombosis in the mesenteric vessels supports our diagnosis.

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1 Iyer HV, Abaci BF, Rehnke EC, *et al*. Intestinal obstruction due to schistosomiasis. *Am J Surg* 1985;**149**:409-11.
2 Cheng TC. *General parasitology*. 1st ed. New York, London: Academic Press, 1974:423.
3 Binford C, Conner DH. Schistosomiasis. In: *Pathology of tropical and extraordinary diseases*. Vol 2. 2nd ed. Kent: Castle House Publications, 1979:495.
4 Symmers WSTC. *Systemic pathology*. Vol 3. 2nd ed. Edinburgh: Churchill Livingstone, 1978:1063.
5 Schwartz SI. *Principles of surgery*. 4th ed. New York: McGraw Hill Book Company, 1984:1433.

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Bronchoconstrictor properties of preservatives in ipratropium bromide (Atrovent) nebuliser solution

The original formulation of ipratropium bromide nebuliser solution (Atrovent) caused paradoxical and severe bronchoconstriction in some asthmatic patients. We showed that this response was due to hypotonicity of the original solution,[1] and as a consequence it was reformulated to render it isotonic. Recently, however, bronchoconstriction after inhalation of isotonic ipratropium bromide solution has also been reported. As well as containing the active ingredient ipratropium bromide, Atrovent also contains benzalkonium chloride (0·25 g/l) and edetic acid (EDTA) (0·5 g/l). We investigated the role of these additives in causing bronchoconstriction.

Patients, methods and results

Twenty two subjects with stable asthma (10 women, 12 men, mean (SEM) age 41 (3) years) whose airways response to isotonic Atrovent nebuliser solution had not been determined were studied. All patients initially attended the laboratory to inhale 4 ml isotonic Atrovent followed by measurement of forced expiratory volume in one second (FEV_1) for up to 60 minutes. Those in whom the FEV_1 fell