

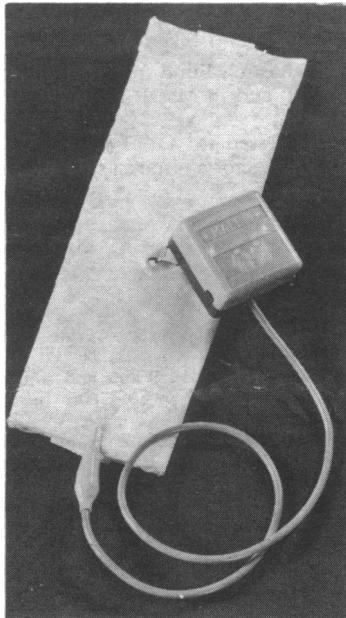
## SHORT REPORTS

### Electronic bed-wetting alarm and toilet trainer

In many children with enuresis repetitive awakening by an alarm as soon as urination begins will gradually train the brain to exert automatic control over the bladder. The child will eventually either wake up before urination or sleep throughout the night without needing to empty the bladder. Such treatment is accepted as the most successful way of curing bed-wetting and may result in over 80% success within a few months.<sup>1</sup> A few children become adolescent and then adult without any of the methods available up until now achieving dry nights.

#### New device and method of use

Existing devices are cumbersome and expensive. They need careful tuition and intensive follow-up to achieve a good rate of success. These are not always available and failure is common. An alternative device has been developed which has many advantages over the traditional bell and pad. It is a matchbox-size, light-weight (50 g) alarm that may be worn unobtrusively on the patient.



Electronic bed-wetting alarm.

The alarm uses hygienic, cheap, and readily available press-on towels and is permanently connected to the sensor so that accidental separation cannot occur. The alarm is triggered as soon as the absorbent press-on towel is moistened, so that actual wetting of the bed may be avoided. The alarm automatically resets and can be used repeatedly during the same night without parental help. The alarm has no on/off switch and the patient cannot forget to switch it on or switch it off and go back to sleep as only drying the sensor inactivates the alarm. The alarm is easily portable and may be used away from home. It may be worn during the day for toilet training of the mentally handicapped and may also have a role in geriatrics to alert nurses to the time of micturition.

**Case history**—A 12-year-old girl presented in 1974 with enuresis, having failed to respond to any of the usual remedies. Over the next eight years she was seen by many doctors and specialists. Proteinuria of minimal-change glomerulonephritis was treated, but enuresis continued whether laboratory measurements reflecting her nephrotic syndrome were normal or abnormal and despite attempts to cure or modify with tricyclics, diuretics, ephedrine, and a trial with the bell and pad. In November 1981 she was issued with the alarm described with written instructions only. She was woken by the alarm, presumably as a result of some loss of urine but not enough to wet the bed. She then micturated normally and returned to her dry bed. After some weeks she found herself waking before the alarm and was hoping soon to be confident enough to return the alarm. She was delighted with this, awakening for the first time in her life in nightclothes and a bed not smelling and saturated with urine. She had slept away from home for the first time, though she was still choosing friends who were aware of her problem, and two months later was considering a holiday. We are aware of many successes with patients using this alarm, but know of no more impressive example of success where other treatments have failed.

The equipment has now been issued to more than 100 Nottingham children with enuresis, some attending hospital, some local authority clinics, and some acquiring the equipment without intervention of medical personnel. Many successes, no failures, and no complaints have been reported. Those with experience of other equipment had a strong preference for the new device. Details of the first 15 patients to be treated—their age, sex, and the duration in weeks of treatment until they were dry—are as follows: age 11 (F) 18 weeks; age 11 (M) 26 weeks; age 12 (M) 26 weeks; age 10 (M) 31 weeks;

age 9 (M) eight weeks; age 10 (F) 12 weeks; age 8 (F) two weeks; age 14 (F) 15 weeks; age 14 (F) 19 weeks; age 7 (F) 13 weeks; age 14 (F) two weeks; age 16 (M) three weeks; age 16 (M) five weeks; age 8 (M) four weeks; age 20 (F) eight weeks.

#### Comment

The device described is safe and effective. Those with experience of alternative systems have no doubt about the merits of this new device, which is much simpler to use and is neither cumbersome nor intrusive. The patient wears normal nightclothes, in contrast to using the bell-and-pad method when it is recommended that no "bottoms" should be worn. It is cheaper to buy, easier to store, and no staff time is needed for instruction or supervision. Direct sales to the public, without medical supervision and without incident, have now been taking place for nine months, after initial successful trials under medical supervision. There may be objections to this approach, but much medical and nursing time is saved by reducing the need for consultation and instruction. Presentation of renal or other disease as enuresis is rare, and will still be detectable when failure of this device to train a child results in medical consultation. Improved results in treating enuresis should reduce stress for children and parents.

<sup>1</sup> Meadow R. How to use buzzer alarms to cure bed-wetting. *Br Med J* 1977;iii:1073-5.

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### Cryptosporidial enteritis without general or selective immune deficiency

Recent reports have described an acute enterocolitis associated with infection by the protozoan cryptosporidium.<sup>1-4</sup> Infection by a wide range of organisms often develops in immunologically deficient patients. We describe a case of intestinal cryptosporidiosis with only mild variations from normal immunological variables.

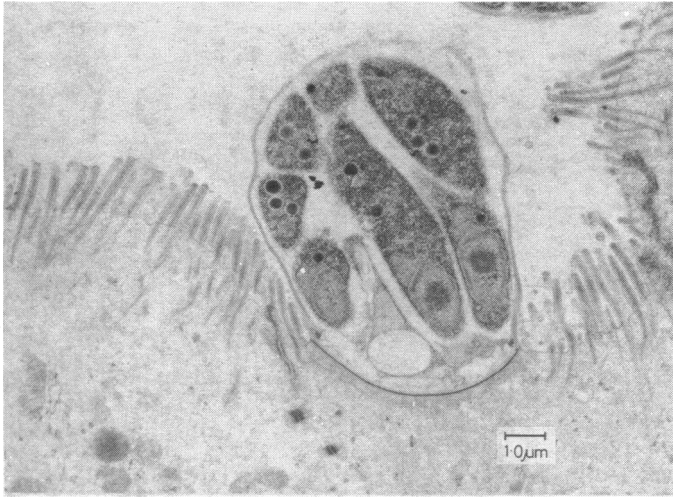
#### Case report

A 24-year-old woman was admitted in June 1979 with a five-day history of colicky central abdominal pain and nausea and having passed frequent greenish watery stools. She had not been abroad and had no history of atopy but had been admitted 10 years earlier for abdominal pain, which had settled after 24 hours. On examination her temperature was 38.2°C and she had mild generalised abdominal tenderness, with some guarding and rebound tenderness in the right iliac fossa. Rectal examination showed generalised tenderness, worse on the right. White cell count was  $6.0 \times 10^9/l$  and haemoglobin concentration 13.4 g/dl. A limited right hemicolectomy was performed at laparotomy, the ileum appearing thickened and congested, clinically suggesting acute Crohn's disease. She recovered with no further abdominal pain or diarrhoea and two years later remained well. A rectal biopsy specimen was taken at routine follow-up a month after discharge.

Macroscopically the terminal ileum and caecum had mildly congested serosa while the bowel wall and mucosa appeared normal. Histologically the mucosa of both ileum and caecum showed mild inflammatory changes with crypt abscesses but no ulceration, granuloma formation, or extension of inflammation into the submucosa. Peyer's patches in the ileum were prominent with germinal centres, and there was reactive follicular hyperplasia of the draining lymph nodes. The surface epithelium of the ileal and caecal mucosa was covered with small haematoxyphil bodies, which on transmission electron microscopy were protozoa 3-4 μm in diameter attached to the microvillar surface of mucosal cells (figure). These were identified as cryptosporidia.

The rectal biopsy specimen taken at follow-up showed a normal, un-

inflamed mucosa with no parasites. Sections from the mucosa of ileum and caecum and the rectal biopsy specimen, trypsinised and stained with antisera to immunoglobulins, kappa and lambda chains, and IgA secretor piece, using the immunoperoxidase method, showed similar numbers and distributions of positive lymphocytes to those in normal controls. Peripheral lymphocyte subpopulations showed normal T- and B-cell proportions with a normal distribution of surface immunoglobulin classes on B cells. T-cell transformation was normal after stimulation by phytohaemagglutinin. Serum



Caecal epithelial microvillar surface showing cryptosporidium schizont containing merozoites.  $\times 18\ 000$  (original magnification).

IgG concentrations and complement components C3 and C4 were normal, serum IgA was low (400 mg/l; normal 860-3700 mg/l), IgM low (510 mg/l; normal, 700-3700 mg/l), and IgE raised (205 U/ml using paper radio-immunosorbent test; normal adult mean 122 U/ml).

### Comment

The ultrastructure of these organisms was sufficiently distinctive for a diagnosis to be made on morphology alone, and in our case the inflammation within the ileal and caecal mucosa was probably due to the organism. The patient's immune state, with marginally decreased concentrations of serum IgA and IgM, though not fulfilling any of the recognised criteria for general or selective immune deficiency, suggests an element of unexplained immune paresis. The virus-like particles found in the nucleus and cytoplasm of mucosal epithelial cells by Bird and Smith<sup>5</sup> were not found in our case. Increased awareness of cryptosporidial enterocolitis may increase the frequency of detection of such cases.

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<sup>1</sup> Meisel JL, Perera DR, Meligro C, Rubin CE. Overwhelming watery diarrhoea associated with a cryptosporidium in an immunosuppressed patient. *Gastroenterology* 1976;**70**:1156-60.

<sup>2</sup> Lasser KH, Lewin KJ, Rynning FW. Cryptosporidial enteritis in a patient with congenital hypogammaglobulinaemia. *Hum Pathol* 1979;**10**:234-40.

<sup>3</sup> Nime FA, Burek DJ, Page DL, Holscher MA, Yardley JH. Acute enterocolitis in a human being infected with protozoan cryptosporidium. *Gastroenterology* 1976;**70**:592-8.

<sup>4</sup> Royal College of Physicians of London. Immunodeficiency and cryptosporidiosis. *Br Med J* 1980;**281**:1123-7.

<sup>5</sup> Bird RG, Smith MD. Cryptosporidiosis in man; parasite life cycle and fine structural pathology. *J Pathol* 1980;**132**:217-33.

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## Frequency of swallowing in duodenal ulceration and hiatus hernia

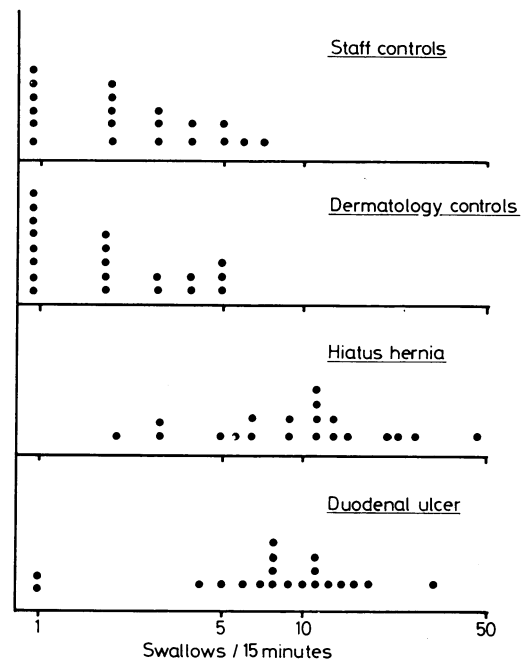
There is wide individual variation in the rate of spontaneous swallowing. In the absence of food up to 5 ml of air accompanies saliva to the stomach with each swallow.<sup>1</sup> The air that is not eructated moves further along the gastrointestinal tract, eventually being passed as flatus. Aerophagia may be a cause of functional dyspeptic complaints such as belching or bloating. There are rare reports of massive gastric dilatation and even death.<sup>2</sup> Excessive air-swallowing has been reported in some patients with hiatus hernia, peptic ulceration, cholelithiasis, or myocardial ischaemia.<sup>3</sup>

In the past diagnosis of aerophagia has relied on symptomatology and observation during interview. No attempt has been made to measure the rate of air-swallowing.

### Patients, methods, and results

Four groups were studied—namely, 20 patients with duodenal ulceration diagnosed by endoscopy (15 men, mean age 38.8 years); 20 patients with hiatus hernia proved by either endoscopy or radiology (11 men, mean age 45.8 years); 20 dyspepsia-free dermatology outpatients (six men, mean age 35.1 years); and 20 dyspepsia-free hospital staff (13 men, mean age 36.1 years).

The frequency of swallowing was measured simultaneously in two ways. (1) A mercury-loop strain gauge was placed around the neck, resting just above the thyroid cartilage, and the change in circumference of the neck associated with movement of the cartilage during swallowing was recorded as a pen deflection on a polygraph. (2) A throat microphone, lightly held in place by a spring clip, recorded a characteristic noise during swallowing. These methods were validated before the study by comparing subjects' self-reported swallows marked by one observer with the records from the above methods that were interpreted over the same period by another observer, blind to the subject. No discrepancies occurred when both methods were used together.



Rate of swallowing in the four groups. Each point represents one subject.

The subjects were seated alone for 15 minutes in an anechoic chamber. Wearing earphones, they listened for 10 minutes to 26 random one-second 90 dB tones followed by five minutes of silence. The number of spontaneous swallows during the 15 minutes was counted. Skin conductance level and responses were measured during the test. Subsequently, salivary output was measured by weighing dental rolls. Anxiety was rated by use of visual analogues and the Spielberger self-evaluation questionnaire. Statistical significance was assessed by the Mann-Whitney U test.

The figure shows that the median swallow count in the healthy controls was not significantly different from that in the dermatology outpatients (2.7