showed a haemoglobin concentration of 124 g/l; white cell count $2{\cdot}4 \times 10^9$/l (76% neutrophils, 20% lymphocytes, 4% monocytes); platelet count 200×10^9/l; sedimentation rate 44 mm in first hour; normal urea and electrolytes and liver function values; antinuclear factor titre positive at 1/1280; rheumatoid arthritis haemagglutination titre positive at 1/80; and double stranded deoxyribonucleic acid (DNA) binding 94 U/ml (normal 25 U/ml). She was a slow acetylator and her HLA type was A1 AW24 B7 B17 DR2, DR3. Chest *x* ray appearances were normal.

In view of the polyarthritis, cutaneous vasculitis, pleurisy, leucopenia, positive antinuclear factor titre, and raised DNA binding value, a diagnosis of carbamazepine induced systemic lupus erythematosus was made. The carbamazepine was withdrawn but the phenobarbitone continued. Predisolone 30 mg daily was added. The patient improved rapidly and prednisolone was stopped after six months. Subsequently she remained well for 12 months. The DNA binding returned to normal but her antinuclear factor titre remained positive at 1/160.

Comment

The rapid resolution of this patient's illness on withdrawal of carbamazepine and lack of recurrence over the next year strongly suggest that the systemic lupus erythematosus was drug induced. The patient was a slow acetylator and possessed HLA-DR3, both of which may predispose to drug induced lupus erythematosus.[2] Several case reports suggestive of carbamazepine induced systemic lupus erythematosus have appeared[3 4] or been reported to the Committee on the Safety of Medicines and Ciba-Geigy Pharmaceuticals, but many have lacked confirmatory laboratory investigations. This case report shows that tests for antinuclear factor and DNA binding should be done when there is multiorgan disease associated with idiosyncratic reactions to drugs including carbamazepine. A small study of antinuclear factor in nine epileptics receiving only carbamazepine showed that seven had antibodies to soluble nucleoprotein.[5] Carbamazepine should therefore be added to the list of anticonvulsants which may induce systemic lupus erythematosus, though the risk is considerably less than with phenytoin.

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1 Lee SL, Chase PH. Drug induced systemic lupus erythematosus: a critical review. *Sem Arthritis Rheum* 1975;**5**:83-103.
2 Batchelor JR, Welsh RM, Inoco RM, *et al*. Hydrallazine induced systemic lupus erythematosus: influence of HLA DR and sex susceptibility. *Lancet* 1980;i: 1107-10.
3 Simpson JR. "Collagen disease" due to carbamazepine. *Br Med J* 1966;ii:1434.
4 Kolstee HJV. A patient with disseminated lupus erythematosus caused by the use of carbamazepine. *Ned Tijdschr Geneeskd* 1983;**127**:1588-93.
5 Alarcon-Segovia D, Fishbein E, Reyes PA, Dies H, Shwadsky S. Antinuclear antibodies in patients on anticonvulsant therapy. *Clin Exp Immunol* 1972;**12**: 30-47.

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Polymicrobial infection in campylobacter enteritis

Campylobacter subsp *jejuni* has recently been recognised as a common cause of bacterial gastroenteritis in children. We have determined the prevalence of polymicrobial enteritis with *Campylobacter* compared with other enteric pathogens in our hospital.

Materials, methods, and results

All stool specimens submitted to the bacteriology laboratory from December 1980 to October 1983 were cultured for *Campylobacter* and other gastrointestinal pathogens. Specimens were inoculated on to a selective plating medium (modified Skirrow's medium; Skirrow's medium and amphotericin B 2 mg and novobiocin 5 mg/l) and the plates incubated at 42 C for 48 hours in 5% oxygen, 10% carbon dioxide, and 85% nitrogen. *Campylobacter* was identified by Gram's stain and biochemical characteristics.

A retrospective survey was made of the records of all children with enteric pathogens, including *C jejuni*, cultured in stools.

A total of 945 specimens from 661 children were tested during the three years. *C* subsp *jejuni* was isolated from the stools of 131 children. During the same period *Shigella* was found in 354 children, *Salmonella* in 122, and enteropathogenic *Escherichia coli* in 54. In 22 of the 131 cases (3·3%) *Campylobacter* was found together with other enteric pathogens—namely, *Salmonella* (eight cases), *Salmonella* and *E coli* (two), *Shigella* (eight), *Shigella* and *E coli* (two), and *E coli* (two) (see table). Mixed infections without *C jejuni* were found in five patients with *Salmonella* (0·8%) and two with *Shigella* (0·3%).

Comment

Since Skirrow devised a selective medium for identifying *C* subsp *jejuni* this organism has come to be recognised as an important enteric pathogen in man, causing acute and subacute illness. Many clinical microbiology laboratories are now using methods for isolating this organism from faecal culture, and many studies have been performed evaluating the clinical and epidemiological features of infection with *Campylobacter*, *Salmonella*, enteropathogenic *E coli*, and *Shigella*. Lassen and Kapperud reported four years' experience with *C jejuni* in Norway. Out of 249 patients infected with *C jejuni*, *Salmonella*, or *Shigella*, 40 (16·1%) had mixed infections—25 with *C jejuni* and *Salmonella*, 13 with *C jejuni* and *Shigella*, and two who were excreting all pathogens.[1]

Pitkanen *et al* summarised the clinical picture and epidemiological characteristics of infection with *C jejuni* in 186 patients admitted to hospital in Finland during a three year period.[2] A mixed infection was detected in 14 patients, and the most frequent pathogen in these was *Salmonella*, which was isolated in 11 cases. In Israel Shmilovitz *et al* succeeded in isolating *C jejuni* from 2430 patients in two years. In 176 of them (7·2%) *C jejuni*, *Salmonella*, or *Shigella* was isolated concomitantly—*C jejuni* and *Salmonella* in 104 patients, *C jejuni* and *Shigella* in 69, and *C jejuni*, *Salmonella*, and *Shigella* in three.[3]

In our series we checked for mixed infections with other enteric pathogens and found a surprisingly low incidence of mixed infections with all other pathogens compared with those with *C jejuni* (Student's *t* test: $p < 0{\cdot}005$). This has not been noted before and may have therapeutic implications. Robins-Browne *et al* found that erythromycin was ineffective in campylobacter associated enteritis and attributed this in part to the fact that all but eight of their 26 patients were infected with at least one erythromycin resistant enteropathogen in addition to *C jejuni*.[4] The high prevalence of polymicrobial enteritis in their group is considered a normal phenomenon in developing countries.

Many mixed infections appear to show microbial synergism, mediated by any of four basic types of interaction. A micro-organism may lower host resistance and thereby increase the likelihood of invasion by another micro-organism, facilitate colonisation of potential hosts by providing elements essential to the growth of other micro-organisms, or increase the virulence of other micro-organisms.[5]

Campylobacter may diminish the ability of the host to resist invasion by other pathogens. It may achieve this by altering cellular immunity, humoral immunity, or the anatomy of the host. In a previous study we found that *Campylobacter* may facilitate colonisation by enteric pathogens, especially in immunocompromised patients.

Little is known about the specific mechanism of synergistic infection, and the pathogenicity of campylobacter infection is not clear. Further work is needed to elucidate the exact mechanism of campylobacter polymicrobial infections.

Prevalence of C jejuni among enteric pathogens isolated from cases of polymicrobial enteritis during December 1980 to October 1983

	Organisms isolated from mixed infections with *Campylobacter*						Organisms isolated from mixed infections without *Campylobacter*			
	Salmonella	*Shigella*	*E coli**	*Salmonella* + *E coli**	*Shigella* + *E coli**	Total	*Salmonella* + *Shigella*	*Salmonella* + *E coli**	*Shigella* + *E coli**	Total
No of patients	8	8	2	2	2	22	1	4	2	7

*Enteropathogenic *E coli*.

1 Lassen J, Kapperud G. Epidemiological aspects of enteritis due to campylobacter in Norway. *J Clin Microbiol* 1984;**19**:153-6.
2 Pitkanen T, Ponka S, Pettersson T, Kosunen T. Campylobacter enteritis in 188 hospitalised patients. *Arch Intern Med* 1983;**43**:215-9.
3 Shmilovitz M, Kretzer B, Rotman N. Campylobacter jejunii as an etiologicaalgent of diarrheal diseases in Israel. *Isr J Med Sci* 1982;**18**:935-40.
4 Robins-Browne RM, Mahehdra K, Mackenjee MB, Marilyn N, Coovadia M. Treatment of campylobacter-associated enteritis with erythromycin. *Am J Dis Child* 1983;**137**:282-6.
5 Mackowiak PA. Microbial synergism in human infections. *N Engl J Med* 1978; **298**:1, 21-6, 84-6.

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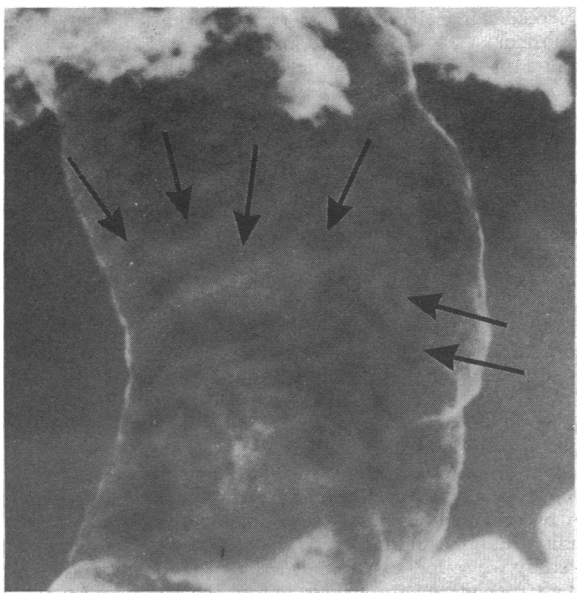
Campylobacter colitis with intestinal aphthous ulceration mimicking obstruction

We report what we believe to be the first case of aphthous ulceration of the intestine in a child with colitis due to campylobacter. This child had the characteristic mucosal lesions of herpetic gingivostomatitis,



X ray film showing numerous aphthous ulcers (arrowed) present in colon in campylobacter colitis.

which also have not been recorded before with this particular bowel infection. The stools did not contain blood or mucus, and the initial tentative diagnosis was of bowel obstruction.

Case report

A 7 year old boy presented with a five day history of intermittent periumbilical pain and was referred to us because of suspected obstruction. Two other children attending his school and using the same dining room had acute enteritis. Within this cluster one child was eventually found to have campylobacter in his stool. Our patient had severe vomiting and became more than 10% dehydrated. A swinging fever with a peak at 40°C was observed. The stools were loose but at no time contained blood or mucus; they were characterised by being malodorous. In addition he had glossitis and gingivitis. He did not have ocular or genital signs of inflammation to suggest Behçet's disease.

When he was admitted to hospital his diarrhoea, which had been a prominent feature, resolved and a stool could not readily be obtained for culture. To avoid a delay in establishing the diagnosis, however, a rectal swab was cultured and produced a heavy growth of campylobacter. Other pathogens known to be associated with colitis, such as amoebas, salmonella, shigella, and yersinia, were not recovered.

The results of investigations were: haemoglobin concentration 131 g/l; white cell count $8{\cdot}2 \times 10^9$/l; erythrocyte sedimentation rate 5 mm in the first hour; negative results of a Widal test; amylase activity 195 U/l (normal 70-300 U/l); sodium concentration 145 mmol(mEq)/l; results of amoebic complement fixation test 1/16, of Paul-Bunnell (Monospot) test negative, of cytomegalovirus complement fixation test < 1 in 2, and of toxoplasma fluorescence antibody test negative; total protein concentration 61 g/l (normal 60-80 g/l); albumin concentration 49 g/l (normal 32-50 g/l); gammaglobulin concentration 20 g/l (normal 20-40 g/l); and Coxsackie B virus titres not significant. A nose swab yielded *Haemophilus influenzae* and *Staphylococcus aureus*, and a throat swab yielded normal flora. No virus was seen on electron microscopy of stool, and a midstream specimen of urine yielded no cells or growth. A radiograph of the abdomen showed distended bowel with several fluid levels in the colon. Because the pain, vomiting, and fever persisted a double contrast barium enema was performed (figure), and this showed extensive fine aphthous ulceration of the large bowel. We were not given permission to carry out sigmoidoscopy and rectal biopsy or small bowel radiological and histological studies to exclude Crohn's disease (discrete (or aphthoid) ulcers are a characteristic and common finding in Crohn's disease of the colon).[1]

He responded rapidly and completely to erythromycin 20 mg/kg/day. As the colitis resolved clinically so did the oral problem.

Comment

Aphthous ulceration of the colon in childhood has not been reported before, although campylobacter colitis has been described.[2] Moreover, glossitis and gingivitis have not previously been noted in campylobacter colitis. Ellis *et al*, however, reported a mouth ulcer in an adult with the disease.[3] Our patient showed that campylobacter colitis can present with some features suggesting bowel obstruction rather than colitis, and in such cases there is a risk of unnecessary laparotomy, particularly if a patient is referred directly to a surgeon. Although taking a rectal swab is often impugned as a diagnostic method,[4] it is worth while in avoiding delay in establishing the diagnosis in the rare cases in which a stool cannot be obtained.

1 Max RJ, Kelvin FM. Nonspecificity of discrete colonic ulceration on double contrast barium enema study. *Amer J Roentgenol* 1980;**134**:1265-7.
2 Guandalini S, Cucchiara S, de Ritis G, *et al*. Campylobacter colitis in infants. *J Pediatr* 1983;**102**:72-4.
3 Ellis ME, Pope J, Mokashi A, Dunbar E. Campylobacter colitis associated with erythema nodosum. *Br Med J* 1982;**285**:937.
4 Silverman A, Roy CC. *Pediatric clinical gastroenterology*. London: C V Mosby, 1983.

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Topical rubefacient ointment: studies on haemostasis

Rubefacient ointments are widely used for the treatment of musculoskeletal pain, often with concurrent oral analgesia. These compounds generally consist of salicylate esters, heparinoids, and nicotinic acid esters, a combination designed to enhance the anti-inflammatory and analgesic effects of the individual substances.[1]

Systemic absorption of any of the active ingredients may disturb the haemostatic mechanism,[2-4] and the concurrent use of aspirin would aggravate any effect. Animal studies show systemic effects and detect-