effect was particularly pronounced, and sodium retention, with concomitant weight gain, was also evident. These effects appeared, however, at much lower doses (0.7-1.4 g glycyrrhizinic acid) than those used in other studies (4-9 g).¹⁻⁴

Both doses in this study seemed to be equipotent in causing electrolyte and RAA axis disturbance, but the higher dose caused the most rapid changes. Some volunteers had considerable suppression of the RAA axis and no obvious electrolyte imbalance, but presumably electrolyte imbalance would occur eventually. Of the RAA axis values studied, both PRA and urinary aldosterone concentrations seemed to be the worse affected and to the same degree. Subnormal levels indistinguishable from those seen in Conn's syndrome were the rule. Plasma angiotensin II and plasma aldosterone were less discriminatory and their measurement alone would not single out the liquorice eater from others. One subject clearly suppressed all three RAA axis values after one week, gained 1.4 kg in weight, developed oedema of the ankles, but then returned to normal by the next week despite continued liquorice ingestion. He adapted in some way to the liquorice compound, presumably by altered absorption or degradation. Whatever the adaptation mechanism might be, however, our results suggest that such people represent a small minority and that potentially serious metabolic effects will occur in people consuming moderate daily doses of liquorice for periods as short as one week. Nearly all subjects will be affected within one month.

We can only speculate about the effect of smaller daily doses or larger less regular doses, but it would seem prudent to advise patients with hypertension or other circulatory disorders to abstain completely and for others to be made aware of its potential toxicity.

In all but the most severely affected subjects hormonal values quickly returned to normal once liquorice was withdrawn. We therefore presume that many cases of liquorice toxicity go unrecognised, particularly after admission to hospital, where the source of the problem is removed.

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References

- 1 Groen, J, *et al*, *New England Journal of Medicine*, 1951, **244**, 471.
- 2 Groen, J, *et al*, *Journal of Clinical Investigation*, 1952, **31**, 87.
- 3 Carb, W I, *et al*, *Lancet*, 1953, **1**, 663.
- 4 Louis, L, and Conn, J W, *Journal of Laboratory and Clinical Medicine*, 1966, **47**, 20.
- 5 Conn, J W, Rovner, D R, and Cohen, E L, *Journal of the American Medical Association*, 1968, **205**, 80.
- 6 Haber, E, *et al*, *Journal of Clinical Endocrinology and Metabolism*, 1969, **29**, 1349.
- 7 Ito, T, *et al*, *Journal of Clinical Endocrinology and Metabolism*, 1972, **34**, 106.
- 8 Nicholls, M G, and Espiner, E A, *New Zealand Medical Journal*, 1975, **81**, 490.
- 9 Nicholls, M G, *et al*, *Clinical Science and Molecular Medicine*, 1974, **47**, 301.
- 10 Dunnett, C W, *American Statistical Society Journal*, 1955, **50**, 1096.

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SHORT REPORTS

Toxoplasmosis and erythema nodosum

Erythema nodosum is characterised by a red, nodular skin eruption that is classically described as occurring on the shins. Traditionally it has been associated with diseases such as streptococcal infections, sarcoidosis, and, in days gone by, tuberculosis.¹ Viral infections, pasteurella infections, and coccidioidomycosis have also been implicated. Sulphonamides and the various contraceptive pills have been blamed. A few patients with ulcerative colitis and malignant disease have erythema nodosum. Recently erythema nodosum has been found in patients with leptospirosis² and brucellosis.³ On the other hand, no cause for erythema nodosum can be found in many cases, the percentage of cases varying in different series from 9-30%.¹

I describe here the clinical features of two women who presented with erythema nodosum and who were subsequently found to have toxoplasmosis. One of these cases has already been noted.⁴ No mention of this association has been made in reports of either toxoplasmosis⁵ or erythema nodosum.¹

Case reports

Case 1—A 32-year-old woman presented in September with typical erythema nodosum—that is, several small, tender, red nodules on both shins. She complained of aches in various joints and extreme tiredness. Her haemoglobin was 10.4 g/dl, white cell count $8.0 \times 10^9/l$ ($8000/mm^3$), and erythrocyte sedimentation rate 21 mm in the first hour. X-ray examination of her chest showed bilateral enlarged hilar nodes. Initially sarcoidosis was diagnosed, but the results of the Sabin-Feldman dye test for toxoplasmosis was positive with a titre of 1/8192. Test results for brucellosis were weakly positive: the result of the standard agglutination test was negative, antihuman globulin test gave a titre of 1/160, and complement fixation a titre of

1/8, indicative of old infection only. This case seemed similar to the "bilateral hilar lymphadenopathy syndrome" described by Rook.¹

Case 2—A 33-year-old woman presented in December with several large, tender, red, nodular patches. Uncharacteristically these lesions were found on both buttocks and took several months to subside. She also complained of being tired and of a painful left elbow. Her haemoglobin was 12.8 g/dl, white cell count $8.0 \times 10^9/l$ ($8000/mm^3$), and erythrocyte sedimentation rate 2 mm in the first hour. She had no lymphadenopathy and an x-ray picture of her chest was normal. The result of the Sabin-Feldman dye test was positive 1/1024. Toxoplasma-specific IgM was detected at 1/32 by immunofluorescence. Results of brucellosis tests were negative.

Comment

Both women are married to dairy workers, and live on farms. Both work with the cows alongside their husbands in the byres, and naturally come in contact with other animals such as cats, dogs, and sheep. The second patient in particular emphasised that she made a point of feeding and looking after the numerous farm cats.⁴

¹ *Textbook of Dermatology*, ed A J Rook, D S Wilkinson, and J G Ebling, 2nd edn, Vol I. Oxford, Blackwell, 1972.

² Goldstein, R S, *British Medical Journal*, 1976, **1**, 809.

³ Derham, R L J, *et al*, *British Medical Journal*, 1976, **2**, 403.

⁴ Longmore, H J A, *British Medical Journal*, 1975, **1**, 94.

⁵ Beattie, C P, *Toxoplasmosis*, Lister Fellowship Lecture, no 28. Royal College of Physicians of Edinburgh, 1964.

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