Letters to the Editor

High incidence of group C streptococci isolated from throat swabs

In 1980 Ghoneim and Cooke[1] reported three cases of septicaemia due to Lancefield group C streptococci. Since then all β-haemolytic streptococcal isolates at the Leeds General Infirmary have been grouped using a rapid latex method.

We have analysed the data for the past five years and have noted an increase in the incidence of group C streptococci among β-haemolytic streptococci from throat swabs. Such a preponderance of group C isolates is higher than that found by other workers.[2–4]

Quinn[2] has noted a fall in the proportion of group A streptococci isolated from throat swabs from school children in Nashville, USA, between 1953 and 1955 (84%) and in 1961–67 (62·6%). Group C streptococci accounted for 16·2% of the β-haemolytic isolates in the second period of study and presumably this figure represents a rise from the previous period of study, where the total of all β-haemolytic streptococci other than group A was 16%.

Several workers have noted a higher proportion of group C streptococci among β-haemolytic streptococci in tropical and sub-tropical countries,[5 6] but there are no reports from temperate regions of a high frequency of group C streptococcal isolates.

Table 1 shows the frequency of group A, B, C, D, F, and G isolates in each complete year 26 March to 25 March from throat swabs received at the Leeds General Infirmary Bacteriology Laboratory. There is an annual variation in the frequency and relative proportion of the different β-haemolytic Lancefield groups. The proportion of group C streptococci, however, rose from 5·2% in 1979–80 to 31·2% in 1981–82 (p < 0·001), and although there was a subsequent fall in the proportion of group C isolated in 1983–84, it was still about 20%.

The isolation frequency of each streptococcal group from all sites, including the throat, is shown in Table 2. Both the absolute numbers and the preponderance of group C streptococci are much smaller when all the isolates are considered rather than only the throat isolates.

We have not found a satisfactory explanation for the high incidence of group C streptococci isolated from throat swabs. There has been no change in the method of Lancefield grouping and little change in the specialties or practices served by the laboratory over the last five years.

We would be interested to see reports of the incidence of group C streptococcal isolates at other laboratories, because there appears to have been a genuine rise in the incidence of group C streptococcal isolates from throat swabs in this area.

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References

[1] Ghoneim ATM, Cooke EM. Serious infection caused by Group C. Streptococci. *J Clin Pathol* 1980;**33**:188–9.
[2] Quinn RW, Federspiel CF. The occurrence of haemolytic streptococci in school children in Nashville, Tennessee, 1961–1967. *Am J Epidemiol* 1973;**97**:22–3.
[3] Cumming CG, Ross PW. Carriage of Group B Streptococci in the upper respiratory tract. *J Clin Pathol* 1981;**34**:813.
[4] Hutchinson RI. Pathogenicity of Group C (Lancefield) Haemolytic Streptococcus. *Br Med J* 1946;ii:575–6.
[5] El Kholy A, Sorour AH, Houser HB, et al. Three year prospective study of Streptococcal infections in a population of rural Egyptian schoolchildren. *J Med Microbiol* 1973;**6**:101–10.
[6] Ogunbi O, Fadahursi I, Ahmed I, et al. An epidemiological study of rheumatic fever and rheumatic heart disease in Lagos. *Journal of Epidemiology and Community Health* 1978;**32**:68–71.

Biphenotypic leukaemia in treated Hodgkin's disease

The finding of leukaemias which involve more than one cell lineage has implications both for treatment and for understanding the pathogenesis of leukaemia. The risk of acute leukaemia in patients treated with chemotherapy alone or in combination with radiotherapy is well recognised.[1–3] Most of these leukaemias are acute myeloid leukaemias, although some rare lymphoid cases have been described.[2 4] Prentice et al[5] reported the first case where there was a mixture of two distinct populations of lymphoid and myeloid blast cells present after treatment for Hodgkin's disease.

We recently saw a patient who developed acute leukaemia after chemotherapy for Hodgkin's disease. A 30 year old woman presented in April 1981 with stage IV B nodular sclerosing Hodgkin's disease and was treated with six courses of MOPP and four of ABVD. Because she developed severe pan-

Table 1 *Frequency of β-haemolytic streptococcal throat swab isolates in each complete year 26 March to 25 March*

Group	Year				
	1979–80 (%)	1980–1 (%)	1981–2 (%)	1982–3 (%)	1983–4 (%)
A	51 (66·2)	37 (40·6)	37 (46·2)	30 (44·1)	70 (50·3)
B	5 (6·5)	22 (24·2)	8 (10·0)	11 (16·2)	14 (10·1)
C	4 (5·2)	20 (22·0)	25 (31·2)	19 (27·9)	27 (19·4)
D	1 (1·3)	0 (0)	1 (1·25)	0 (0)	3 (2·1)
F	7 (9·1)	3 (3·3)	3 (3·75)	0 (0)	5 (3·6)
G	9 (11·7)	9 (9·9)	6 (7·5)	8 (11·8)	20 (14·4)
Total	77 (100)	91 (100)	80 (100)	68 (100)	139 (100)

Table 2 *Frequency of β-haemolytic streptococcal isolates from all sites*

Group	Year				
	1979–80 (%)	1980–1 (%)	1981–2 (%)	1982–3 (%)	1983–4 (%)
A	114 (37·2)	131 (27·8)	128 (23·4)	115 (22·8)	139 (27·9)
B	55 (18·0)	162 (34·4)	191 (34·7)	194 (38·5)	147 (29·5)
C	29 (9·5)	49 (10·4)	52 (9·5)	66 (13·1)	61 (12·2)
D	20 (6·6)	33 (7·0)	52 (9·5)	27 (5·4)	48 (9·6)
F	14 (4·6)	10 (2·1)	20 (3·6)	22 (4·4)	18 (3·6)
G	74 (24·2)	86 (18·2)	104 (19·0)	80 (15·9)	85 (17·1)
Total	306 (100)	471 (100)	547 (100)	504 (100)	498 (100)

cytopenia a delay between courses was often necessary. Radiotherapy was never given. She did not achieve remission. In November 1983, 23% of the peripheral blood white cells were blast forms, which displayed a poorly differentiated morphology with irregular outlined nuclei and a conspicuous nucleolus. Primary granules and Auer rods were not seen. Bone marrow aspirate confirmed the diagnosis of acute leukaemia. The peroxidase reaction was positive in 46% of the blast cells. Twenty two percent of the cells expressed myeloid markers (OKM1^{+}) while 30% had a common acute lymphoblastic leukaemia phenotype (TdT[+], J5[+]). The simultaneous expression of two different types of antigen on the same cell was excluded by a double labelling technique.

Treatment with a cycle of chemotherapy including Ara-C and daunorubicin failed to produce a remission and the patient died of severe granulocytopenia and sepsis resistant to antibiotic treatment.

Immunological markers are a valuable tool in the characterisation of these cell proliferations and the use of a large panel of such markers may indicate that mixed leukaemias are more common than is at present realised. For example, in a recent analysis of patients with chronic granulocytic leukaemia in acute transformation[6] we estimated that 24% had blast cell populations of more than one lineage. We therefore suggest in these cases, as well as in mixed leukaemia secondary to chemotherapy, that the target cell for malignant transformation could be a pluripotent stem cell.

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References

[1] Kyle RA. Second malignancies associated with chemotherapeutic agents. *Sem Oncol* 1982;**9**:131–42.
[2] Pedersen-Bjergaard J, Larsen SO. Incidence of acute nonlymphocytic leukaemia, preleukemia and acute myeloproliferative syndrome up to 10 years after treatment of Hodgkin's disease. *N Engl J Med* 1982;**307**:965–70.
[3] Hans W, Grunwald F, Rosner F. Acute myeloid leukemia following treatment of Hodgkin's disease. *Cancer* 1982;**50**:676–83.
[4] Loine S, Schwartz RS. Immunodeficiency and the pathogenesis of lymphoma and leukaemias. *Semin Hematol* 1978;**15**:117–22.
[5] Prentice AG, Smith AG, Bradstock KF. Mixed lymphoblastic-myelomonoblastic leukaemia in treated Hodgkin's disease. *Blood* 1980;**56**:129–33.
[6] San Miguel JF, Taveres Dé Castro J, *et al.* Characterization of blast cells in chronic myeloid leukaemias in transformation, acute myelofibrosis and undifferentiated leukaemias. II Studies with monoclonal antibodies and terminal transferase. *Br J Haematol* (in press).

Serum creatine kinase isoenzyme levels in patients with cerebral tumours

Creatine kinase BB (CK-BB) isoenzyme is found in large quantities in brain tissue. Raised levels have been detected in the serum and cerebrospinal fluid of patients with a variety of neurological conditions.[1-5] Until now there has been no systematic study of patients with cerebral tumours.

Serum CK-BB was estimated in 34 consecutive inpatients with computed tomographic evidence of neoplasia by Dr RJ Thompson using a radioimmunoassay method described elsewhere.[4] Solitary lesions were either biopsied (18) or resected (5). Multiple lesions or intracranial masses in patients with known malignancy (8) were assumed to be secondary deposits and therefore not biopsied. The remaining three comprised one colloid cyst, carcinomatous meningitis, and a patient whose scan was highly suggestive of an astrocytoma but who declined biopsy. The astrocytomas were graded histologically as well differentiated/low grade (4),

intermediate grade (2), or anaplastic (3); the patient who declined biopsy was classed "intermediate" based on radiological appearance and clinical course. Biopsies from two further astrocytomas were inadequate for histological grading.

The serum CK-BB levels and corresponding diagnoses are given in the Table. Of 31 patients with cerebral tumours, only four had raised levels.[3] These four included all three anaplastic astrocytomas and a patient with two large metastases from a bronchial carcinoma. The levels were significantly greater for anaplastic astrocytomas than for other astrocytomas or other tumour types ($p < 0.01$ and $p < 0.001$, respectively; Mann-Whitney U test).

Although all anaplastic astrocytomas gave raised CK-BB levels, the increase was small. Systemic malignancy often gives high levels,[6] and yet only one patient with secondaries in the brain gave a (marginally) raised result. Lack of raised values in non-invasive tumours is in keeping with recent studies[7] showing that the rise is related to acuteness and extent of brain injury. Further studies may confirm whether the isoenzyme is useful clinically in distinguishing types of cerebral tumours.

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References

[1] Bell RD, Rosenberg RN, Ting R, Mukherjee A, Stone MJ, Willerson JT. Creatine kinase BB isoenzyme levels by radioimmunoassay in patients with neurological disease. *Ann Neurol* 1978;**3**:52–9.
[2] Nanji AA. Serum creatine kinase isoenzymes: a review. *Muscle and Nerve* 1983;**6**:83–90.
[3] Phillips JP, Jones HM, Hitchcock R, Adams N, Thompson RJ. Radioimmunoassay of serum

Diagnoses with corresponding CK-BB level

Diagnosis	No studied	CK-BB ($\mu g/l$) (normal <3 $\mu g/l$)
Astrocytoma		
Anaplastic	3	3·2, 3·7, 5·0
Intermediate	3	0·3, 0·4 (see text)
Low grade	4	0·3, 0·3, 0·4, 1·6
Unclassified	2	0·4, 0·4
Meningioma	3	0·3, 0·4, 0·8
Metastasis	9	Range 0·01–3·1
Colloid cyst	1	0·4
Acoustic neuroma	1	0·01
Haemangiopericytoma	1	2·4
Oligodendroglioma	1	0·5
Pituitary tumour	1	0·9
Cerebral lymphoma	1	1·4
Carcinomatous meningitis	1	1·8
Infarction	3	0·1, 0·5, 0·5
Total	34	