concerted action by the education, medical, and other social services.

Interdependence of Educational, Medical, and Social Services

Much has been achieved in the control of physical disease and in the improvement of economic and social conditions; indeed, the one very largely depends on the other. The layman has been, and will continue to be, as indispensable in medicine as the doctor is in education and in the other social services; all the social services would be impotent without the politician—sufficient proof of this is that public expenditure on education amounted to about £1,800m. in the United Kingdom in 1966,³⁵ and on the health and welfare services provided through the Ministry of Health to just over £1,240m. in the year ended 31 March 1966.³⁶

The development of the child health and public health services of this country is a living example of the interrelationship of medical, social, and educational factors in the promotion of health in all its aspects. Many of the problems of child health that still confront us will not be solved by doctors alone; and certainly not if they work apart in hospitals and medical clinics.

Whatever administrative changes may be made in the organization of the education, health, and social services it is essential that doctors concerned with children, whether in the home, in hospitals, or in schools, should work together and in close partnership with the teachers, the other social workers, and the parents.

All doctors who deal with children should be specially knowledgeable about their emotional, behaviour, and educational difficulties, and proper account should be taken of these during their undergraduate and postgraduate training. None of the postgraduate diplomas up to the present, at any rate, has done this, and there is, unfortunately, strong evidence³⁷ that undergraduate training in paediatrics is not up to standard in many medical schools in this country.

The words that Dr. Hector Cameron wrote 50 years ago are as true now as they were then: "More and more a considerable part of the Profession must busy itself in nurseries and in

schools, seeking to apply there the teachings of Psychology, Physiology, Heredity, and Hygiene."³⁸

This is the fundamental task of health education, and is one that concerns us all. We shall continue to make mistakes, but surely we have at least learnt, to quote the eloquent words³⁹ of Sir Arthur Bryant, that "neither wealth nor power nor comfort, whether for class or individual, are ends in themselves: that the wealth of a nation consists in nothing but the virtue of her children and her children's children. That no profits, education, law, custom, or institution that does not contribute to their health and goodness is of any enduring value."

REFERENCES

- ²¹ Ministry of Education Circular No. 276, 1954. H.M.S.O., London.
- ²² Department of Education and Science, *Health of School Child*, 1964/5, 1966, p. 52. H.M.S.O., London.
- ²³ Britten, Margaret I., Spooner, Rosemary J. D., Dormandy, Katherine M., and Biggs, Rosemary, *Brit. med. J.*, 1966, **2**, 224.
- ²⁴ Department of Education and Science, *Health of School Child*, 1962/3, 1964, pp. 60-71. H.M.S.O., London.
- ²⁵ Report of Committee on Finger Spelling and Signing in Education of the Deaf, 1968. H.M.S.O., London. In press.
- ²⁶ *Health of School Child*, 1964/5, 1966, p. 36. H.M.S.O., London.
- ²⁷ Peaker, G. F., *Standards of Reading of Eleven Year Olds*, 1948/64, Appendix 7, Children and Their Primary Schools, 1967, vol. 2. H.M.S.O., London.
- ²⁸ Morris, Joyce M., *Standards and Progress in Reading*, 1966, p. 303. National Foundation for Educational Research, Slough.
- ²⁹ Department of Education and Science, *Children and Their Primary Schools*, 1967, vol. 1, p. 214. H.M.S.O., London.
- ³⁰ Report of Royal Commission on Law Relating to Mental Illness and Mental Deficiency, 1957. H.M.S.O., London.
- ³¹ *New Society*, 1964, **3**, No. 72, p. 20.
- ³² Wing, J. K., O'Connor, N., and Lotter, V., *Brit. med. J.*, 1967, **3**, 389.
- ³³ Home Office Report on Work of Children's Department, 1961-63, 1964. H.M.S.O., London.
- ³⁴ *Children in Care in England and Wales in 1966*, 1967. H.M.S.O., London.
- ³⁵ Report of Department of Education and Science, *Education in 1966*, 1967, p. 9. H.M.S.O., London.
- ³⁶ Ministry of Health, *Annual Report of the Ministry of Health for the Year 1966*, 1967, p. 6. H.M.S.O., London.
- ³⁷ Jackson, A. D. M., *Brit. J. med. Educ.*, 1966, **1**, 25.
- ³⁸ Cameron, H. C., *The Nervous Child*, 1919, p. V. London.
- ³⁹ Bryant, A., *English Saga*, 1945, p. 334. London.

In addition to the above, extensive use made of the Registrar General's *Statistics Review for England and Wales* for each year up to 1965, Pt. 1, Tables, Med., H.M.S.O., London, and the Annual Reports of C.M.O., Board of Education, from 1908 onwards. H.M.S.O., London.

Haemophilus Osteomyelitis and Arthritis

R. J. FARRAND,* M.A., M.B., B.CHIR. ; J. M. S. JOHNSTONE,* M.B., F.R.C.S.ED.
A. F. MACCABE,* M.D., F.C.PATH., D.P.H.

Brit. med. J., 1968, **2**, 334-336

Capsulated type b strains of *Haemophilus influenzae* readily invade the blood stream in the susceptible age group of 2 months to 3 years. Yet published cases of proved haemophilus osteomyelitis in childhood number no more than 10, and of suppurative arthritis fewer than 40 (Turk and May, 1967; Ravn, 1966).

We describe two cases—one of osteomyelitis of the neck of the femur and the other of suppurative arthritis of the knee—due to *H. influenzae* type b. The organism was isolated from the blood in both cases.

We think it desirable to increase awareness of this cause of haematogenous infection in young children because of the resistance of haemophilus to antibiotics often used in acute osteomyelitis and suppurative arthritis.

Case 1

The patient, a 12-month-old girl, was admitted to hospital in November 1967. Two weeks previously she had had a mild upper

respiratory tract infection which settled without special treatment. For four days before admission she had been feverish and restless, and for two days had held her right hip flexed and had been reluctant to take weight on the right leg.

On examination she was pyrexial (38.5°C.) and irritable, and the pulse rate was 170. She had a tendency to lie in an opisthotonic position though there was no other evidence of meningism. The right hip was partially flexed and lumbar scoliosis concave to the right was present. There was no local tenderness over the right hip or femur. The hip movement was slightly limited in rotation and extension, but was not painful.

Investigations.—Haemoglobin 77%; E.S.R. 129 mm./hour; white blood count 23,000 cu. mm. (84% neutrophils). Serum electrolytes were normal. Three separate blood cultures were taken. X-ray examination showed an effusion of the right hip, confirmed the presence of the lumbar scoliosis, and was suggestive of a mass in the right loin.

* Central Microbiological Laboratories and Paediatric Unit, Northern Group of Hospitals, Edinburgh.

It was decided to observe the child overnight, as no definite diagnosis had been made. The next day the picture was similar, but there was some guarding and tenderness in the right side of the abdomen. Laparotomy was performed to exclude a post-ileal appendicitis, but at operation a normal appendix was found. There was no evidence of an inflammatory mass in the right renal area.

The child was treated with intramuscular ampicillin and there was a gradual improvement in her condition. Because of the opisthotonos a lumbar puncture was performed, and apart from a C.S.F. protein of 204 mg./100 ml. it was normal.

At this stage *H. influenzae* type b was isolated from all three blood cultures. The sensitivity of the organism is shown in the Table.

Antibiotic Sensitivities

Antibiotic	M.I.C. in $\mu\text{g./ml.}$		Antibiotic	M.I.C. in $\mu\text{g./ml.}$	
	Case 1	Case 2		Case 1	Case 2
Benzylpenicillin	0.8	0.4	Sulphonamide ..	60.0	15.0
Ampicillin ..	0.1	0.1	Streptomycin ..	1.25	1.25
Carbenicillin ..	0.2	0.1	Kanamycin ..	1.25	1.25
Cloxacillin ..	3.0	3.0	Gentamicin ..	0.3	0.3
Methicillin ..	2.5	1.25	Colistin ..	0.3	0.6
Cephaloridine ..	3.0	3.0	Erythromycin ..	0.75	0.75
Chloramphenicol	0.6	0.3	Lincomycin ..	10.0	5.0
Tetracycline ..	0.3	0.15	Sodium fusidate	8.0	4.0

After three weeks' treatment with ampicillin there was considerable improvement and antibiotic therapy was discontinued. This was immediately followed by relapse, and on this occasion local tenderness developed over the neck of the femur. X-ray examination showed rarefaction in this area, confirming the presence of osteomyelitis (see Fig.). Blood cultures were repeated and *H. influenzae* type b was again isolated. The patient's serum contained antibodies to the homologous strain of *H. influenzae*, giving a titre of 8 by the haemagglutination method of Turk and Green (1964). No antistaphylolysin was detected in the serum.

Case 1. Radiograph of pelvis showing rarefaction in neck of right femur.

After four weeks' treatment with ampicillin and chloramphenicol the condition was both radiologically and clinically much improved, and the E.S.R. was normal. At this point chloramphenicol was discontinued. After a further four weeks the patient made a complete recovery and ampicillin was also discontinued.

Case 2

A 7-month-old boy presented in November 1967 with a six-day history of irritability, pyrexia, and infection of the upper respiratory tract. On the day before admission it was noticed that movement of the right leg was resented and that the right knee appeared swollen. He had been given a five-day course of oral penicillin before admission.

On examination the child was obviously ill. He was flushed, irritable, and pyrexial (39°C.). He had bilateral otitis media and acute pharyngitis and bronchitis. The right leg was oedematous from mid-thigh to just above the ankle. There was full range of hip movements and also relatively pain-free movement of the knee from a position of 20° fixed flexion to 60° flexion.

Investigations.—Haemoglobin 92%; white blood count 24,000/cu. mm. (86% neutrophils); E.S.R. 80 mm./hour. X-ray examina-

tion of the right leg revealed gross oedema of soft tissue and an effusion of the knee joint. There was no evidence of bony change.

Aspiration of the knee joint yielded thin yellow pus, and lincomycin was instilled. Lincomycin was also given intramuscularly. After 24 hours there was little improvement. The oedema remained and pyrexia persisted (38°C.). The upper end of the tibia was explored and drilled. No frank pus was found, but it was noticed that the periosteum lifted easily from the underlying cortex.

Next day his condition deteriorated and there was a rise in temperature (to 38.5°C.) and pulse and respiratory rates. He developed an opisthotonic posture as in Case 1, but with no evidence of meningism. A lumbar puncture was performed and the C.S.F. showed a protein of 114 mg./100 ml. and sugar 127 mg./100 ml. but was otherwise normal. The child became dehydrated because of diarrhoea and vomiting, intravenous therapy with half-strength Ringer lactate solution was begun, and ampicillin and cloxacillin were given. At this stage *H. influenzae* type b was isolated from both the pus aspirated from the knee and the blood cultures taken at the time of admission. The sensitivity of the organism is shown in the Table. Lincomycin was stopped and the ampicillin and cloxacillin were continued. After a further five weeks on these antibiotics there was a marked clinical improvement and the E.S.R. was normal. The child was discharged home to continue oral ampicillin and cloxacillin. Two weeks later the condition was completely resolved and antibiotics were discontinued.

Discussion

The pathogenesis of *H. influenzae* type b infection is well illustrated by these cases. In both there were respiratory tract symptoms, followed by septicaemia with accompanying development of localized haematogenous disease. A notable feature was the absence of meningeal involvement, which in this age group is common in any septicaemia, and especially when due to *H. influenzae*.

The biochemical abnormalities we ascribed to a change in permeability of the meningeal vessels, resulting from the systemic toxicity of a septicaemia in such young children. The raised protein may indicate an early stage of meningitis, which is likely to have developed eventually in the absence of treatment.

An additional factor in the second case was dehydration, which may have raised both sugar and protein levels. Intravenous fluids were started after the C.S.F. was sampled, but no blood sugar determination was done at that time.

It has been suggested that haemophilus bone infection is less rare than the number of reports would indicate (Busfield and Finlay, 1966); and that there may be a recent change in virulence of this organism (Garvie and Lindop, 1966). In acute bone and joint infections the incidence of *H. influenzae*, and its antibiotic sensitivity, are important from the point of view of initial chemotherapy.

Staphylococcus pyogenes is by far the most frequently incriminated pathogen in osteomyelitis, followed by *Streptococcus pyogenes*. Next in frequency are Gram-negative bacilli, especially salmonellae, and these account for 5–10% of isolations (Hüner, 1964). In a large number of cases no organism is isolated—30 out of 62 in the series of Green (1967)—and fastidious Gram-negative bacilli such as species of *Haemophilus* and *Brucella* may be overlooked. It appears that species of Gram-negative bacilli may cause up to 10% of cases, and unless this is appreciated the chemotherapeutic regimen in suspected osteomyelitis may not be effective.

The antistaphylococcal drugs, cloxacillin, lincomycin, and sodium fusidate, are often used initially in osteomyelitis. Cloxacillin has been given successfully for acute osteomyelitis before the sensitivity of the causative organism is known by Green (1967) and Harris (1967), but this drug has no place in the treatment of Gram-negative infections and is inferior to benzylpenicillin in its action on streptococci. Lincomycin is suggested for staphylococcal osteomyelitis by McMillan *et al.* (1967), but again Gram-negative bacilli are resistant to this antibiotic, and

also to sodium fusidate. It is interesting to note that cases of haemophilus osteomyelitis have been treated successfully with erythromycin (Garvie and Lindop, 1966) and cephaloridine (Taylor and Fallon, 1966).

In our opinion a specific and exclusive antistaphylococcal regimen may be inadequate in so serious a condition as acute osteomyelitis, in which delay in effective treatment increases the danger of bone necrosis and the development of chronic disease. We prefer the view expressed in the *British Medical Journal* (1967), that a broad-spectrum antibiotic must be given in suspected cases. To ensure that treatment is effective against penicillinase-producing staphylococci as well as against the less common infective agents of osteomyelitis, we suggest that cloxacillin plus ampicillin be given initially. If and when a causative organism is isolated a change to appropriate specific therapy should be made, but the first objective is the immediate control of infection in *all* cases.

Summary

In two cases of bone and joint infection by *Haemophilus influenzae* type b the sequence of events was respiratory tract

infection, septicaemia, and localized haematogenous disease. We believe that osteomyelitis due to Gram-negative organisms is commoner than is often appreciated, and for this reason acute bone and joint infection should be treated early with broad spectrum antibiotics, initially by a combination of ampicillin and cloxacillin.

We thank Mr. W. H. Bisset and Mr. I. S. Kirkland for permission to publish these cases.

REFERENCES

Brit. med. J., 1967, 3, 255.
 Busfield, P. I., and Finlay, H. V. L. (1966). *Lancet*, 1, 715.
 Garvie, J. M., and Lindop, R. (1966). *Lancet*, 1, 1378.
 Green, J. H. (1967). *Brit. med. J.*, 2, 414.
 Harris, N. H. (1967). *Brit. med. J.*, 3, 680.
 Hüner, H. (1964). *Dtsch. med. Wschr.*, 89, 919.
 McMillan, N. L., McRae, R. K., and McDougall, A. (1967). *Practitioner*, 198, 390.
 Ravn, H. (1966). *Lancet*, 1, 517.
 Taylor, J. C., and Fallon, R. J. (1966). *Lancet*, 1, 715.
 Turk, D. C., and Green, C. A. (1964). *J. clin. Path.*, 17, 294.
 Turk, D. C., and May, J. R. (1967). *Haemophilus Influenzae: Its Clinical Importance*, p. 61. London.

Ozaena and Iron Deficiency*

HÅKON BARKVE, M.D.; GISLE DJUPESLAND, M.D.

Brit. med. J., 1968, 2, 336–337

The origin and pathogenesis of ozaena are unknown. On the basis of a study of 136 patients with ozaena, extensive epidemiological studies, and animal experiments Bernát (1966) concluded that this disease is a special manifestation of iron deficiency. This conclusion is interesting in that it implies that ozaena might be cured simply by iron therapy.

Iron deficiency is a common disease in Norway (Natvig and Vellar, 1967), but ozaena is rare. This suggests that Bernát's conclusion may not be applicable to all areas. Therefore we made a study of a small series of ozaena patients from the point of view of iron deficiency.

Materials and Methods

Patients seen in the ear, nose, and throat department of Rikshospitalet, Oslo, are referred from all parts of Norway and represent a broad geographical selection. A review of the files of the department (both inpatients and outpatients) for the last 10 years has yielded only 11 patients with ozaena. The total number of patients during the same period was 24,176. We were able to examine nine of the 11 (see Table). All had suffered from ozaena for many years and showed the typical clinical picture of the disease. Bacterial examination of the nasal crusts usually revealed a mixed flora of *Klebsiella ozaenae*, *Corynebacterium diphtheriae*, staphylococci, pneumococci, and proteus.

The patients were questioned about symptoms and examined for signs of iron deficiency. Blood specimens and bone-marrow aspirates were taken three to four hours after a light breakfast. None of the patients were taking iron medications at the time of this study.

Venous blood was drawn into a plastic tube containing edetic acid as an anticoagulant. Haemoglobin and haematocrit were

measured and red cells were counted with standard techniques (Dacie and Lewis, 1963). Blood smears were stained with May-Grünwald-Giemsa's stain. Blood for iron studies was drawn into iron-free tubes. Serum iron and total iron-binding capacity were measured in a Technicon AutoAnalyzer by standard technique. The normal range for serum iron in our laboratory is 90–150 µg./100 ml. for men and 75–125 µg./100 ml. for women. For total iron-binding capacity the normal range is 224–437 µg./100 ml. serum.

Bone-marrow smears were stained with May-Grünwald-Giemsa's stain and also with Prussian blue iron staining (Dacie and Lewis, 1963).

Results

The clinical investigation revealed no signs of iron deficiency in eight patients. One patient (Case 1) had fissures in the corner of the mouth, but showed no alterations of the oral

Details of Cases

Case No.	Sex	Age	Hb (g./100 ml.)	Hct. (%)	Red Cell (mil./cu. mm.)	M.C.H. (µg.)	M.C.H.C. (%)	Serum Iron (µg./100 ml.)	T.I.B.C. (µg./100 ml.)	Iron in Bone Marrow
1	F	70	15.6	46	5.25	30	33	80	—	+
2	F	68	13.7	39	4.50	30	35	100	390	++
3	F	59	14.1	40	4.60	32	36	105	290	++
4	M	68	16.7	48	5.40	31	35	155	310	+++
5	F	50	15.0	44	4.96	30	34	115	310	+++
6	M	47	15.0	40	4.89	31	38	105	300	+++
7	M	41	14.1	41	4.96	28	35	115	340	+++
8	M	49	16.0	45	5.31	30	36	75	280	+++
9	F	33	14.1	40	4.81	30	36	95	330	++

* From Medical Department A, Section of Haematology, and Department of Otorhinolaryngology, Rikshospitalet, Oslo, Norway.