Heatstroke as a possible cause of encephalopathy in infants

Evidence was presented¹ that heatstroke might occur in infants who are excessively wrapped or warmed during an infection. Five babies were described from Newcastle in 1979 with a catastrophic illness for which no explanation could be found except the possibility of heatstroke, of which the features were typical: sudden onset, shock, intractable convulsions, acidosis, leucocytosis, respiratory disturbance, renal impairment, hepatomegaly, loose stools, and a clotting disorder; an outcome of either death or severe brain damage; and at necropsy evidence of cerebral oedema, and degeneration, fatty change, and necrosis of the liver.

There have been no such reports from elsewhere in Britain. To

Categorisation as Reye's syndrome or near miss cot death is debatable and does not settle the question of aetiology. Although we could find direct evidence of overheating in only one case (where the electric blanket had been left on), there was suggestive evidence in seven others, and in the absence of a full history the possibility of heatstroke cannot be discounted. Temperatures on admission may mislead because babies quickly cool on the way to hospital and, contrary to traditional teaching, the presence of sweating does not preclude the diagnosis.⁴

We suggest that clinicians should consider the possibility of heatstroke in babies who present with shock and encephalopathy, should

Details of babies studied

Clinical details															
Case No	Age (months)	Month of illness	Time found	Admission temperature (°C)	Sudden onset	Shock	Seizures	Bicarbonate <15 mmol (mEq)/l	White cell count >15 × 10 ⁹ /l	Respiratory disturbance	Impaired renal function	Hepato-megaly	Loose stools	Clotting disorder	Outcome
1	2	Jan	0900	36.0	+	+	+	+	+	+	+	+	+	+	Died
2	2	Feb	2330	40.0	+	+	+	+	+	+	+	+	+	+	Microcephaly
3	3	Feb	0800	38.6	+	+	+	NA†	+	+	+	+	+	+	Microcephaly
4	3	Feb	0900	39.4	+	+	+	+	+	+	+	+	+	+	Microcephaly
5	3	Dec	0600	39.4	+	+	+	+	+	+	+	+	NA‡	+	Died
6	4	May	0900	38.5*	+	+	Coma†	+	+	+	+	+	+	+	Died
7	4	May	0930	39.5	+	+	+	+	+	+	+	+	+	+	Recovered
8	5	Oct	1200	39.4	+	+	+	+	+	+	+	+	+	+	Died
9	5	Feb	0800	39.4	+	+	+	+	+	+	+	+	+	+	Microcephaly
10	5	Apr	1930	38.2	+	+	+	+	+	+	+	+	+	+	Microcephaly
11	6	May	1200	39.8	+	+	+	+	+	+	+	+	+	+	Microcephaly
12	6	Feb	0800	39.5	+	+	+	+	+	+	+	+	+	+	Epilepsy
13	6	Oct	2330	40.2	+	+	+	+	+	+	+	+	+	+	Developmental delay
14	10	Jan	0800	39.8	+	+	+	+	+	+	+	+	+	+	Died
15	10	Jan	0800	40.2	+	+	+	+	+	+	+	+	+	+	Died

* Temperature not recorded till four hours after admission.

† Coma, but no seizures recorded.

‡ Details not available.

§ RS = Reye's syndrome. HUS = Haemolytic uraemic syndrome. NMCD = Near-miss cot death.

determine whether similar cases were, in fact, occurring we reviewed the notes of selected children from the National Childhood Encephalopathy Study.²

Patients, methods, and results

We studied the case histories of all children under 12 months of age who had been categorised as having Reye's syndrome³ (28 cases) or haemolytic uraemic syndrome (four) or as near miss cot deaths (three). We looked for the features of the illness that had been seen in the Newcastle babies and for evidence of overheating.

Fifteen of the 35 babies had eight or more of the features detailed above, and seven had all of them (table). All 15 babies had been put to bed well or with a trivial infection and were found later, usually next morning, desperately ill. The illness occurred mainly in winter, and the cases were spread throughout the country. Except in one case, temperatures on admission ranged from 38.2 to 40.2 °C. Six of the babies died, and all except one of the survivors suffered brain damage, manifested as microcephaly, spasticity, developmental delay, or seizures.

Results of all relevant microbiological studies were negative. Necropsy was performed in five babies: in one, who died early in the illness, no relevant abnormalities were found. In the other four histological changes similar to those in the Newcastle babies were seen in the brain and liver, and in the small intestine of the one case where this examination was included.

In six babies excessive sweating had been noted, and two others were found completely covered by their bedclothes. In one case an electric blanket had been accidentally left on all night. No other details of clothing, bedding, or heating had been recorded in the hospital notes. Additional inquiry was made four years after the event in one case, but did not support the suggestion of overheating.

Comment

Regardless of the presumptive diagnosis, the illness of these 15 babies was closely similar to that reported from Newcastle and appears to be a distinctive syndrome of uncertain cause.

inquire carefully about clothing and heating, and should anticipate the development of cerebral oedema, renal failure, and disseminated intravascular coagulation. Furthermore, if these suspicions about heatstroke are correct there are very important implications for health education: this devastating illness might be largely prevented by reversal of the folklore that babies, especially when unwell, should always be kept very warm.

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¹ Bacon C, Scott D, Jones D. Heatstroke in well-wrapped infants. *Lancet* 1979;i:422-5.

² Miller DL, Ross EM, Alderslade R, Bellman MH, Rawson NSB. Pertussis immunisation and serious acute neurological illness in children. *Br Med J* 1981;282:1595-9.

³ Bellman MH, Ross EM, Miller DL. Reye's syndrome in children under 3 years old. *Arch Dis Child* 1982;57:259-63.

⁴ Shibolet S, Coll R, Gilat T, Sohar E. Heatstroke: its clinical picture and mechanism in 36 cases. *Q J Med* 1967;36:525-48.

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