

of this study of a reversal of A/E ratio, in that each was significantly different from its respective control group only in the exclusive homosexual (Kinsey 5-6). The significance of this remains to be determined.

While we do not yet have a clear answer as to the relation of the endocrine changes to the direction of sexual drive, this study lends further support to the hypothesis previously proposed: that the metabolic pathway which results in a relatively high androsterone value is associated with sexual preference for females by either sex, whereas a relatively low androsterone value is associated with sexual preference for males by either sex.

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Requests for reprints should be addressed to: Dr. M. S. Margolese, 2080 Century Park East, No. 1603, Los Angeles, California 90067, U.S.A.

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# MEDICAL MEMORANDA

## Hepatitis after Tattooing: A Fatal Case

G. B. HOPKINS, J. V. T. GOSTLING, IAN HILL,  
D. J. N. McNAB, D. P. MULLAN, R. W. B. SCUTT,  
E. A. WRIGHT

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Tattooing as a means of transmitting serum (long incubation) hepatitis is well known and has been reported by Roberts and Still (1950) in Canada, by Smith (1950) in the U.S.A., and in Britain by Robertson (1951) who referred to the unpublished work of Hendry, by Mowat *et al.* (1973), and by Hobson *et al.* (1952) describing cases in Hong Kong. We wish to report a fatal case of hepatitis after tattooing.

### Case Report

A bricklayer, aged 22 years, was notified to one of us (G.B.H.) by a member of the Liver Unit at King's College Hospital (I.H.) as a case of serum hepatitis. There was circumstantial evidence in-

#### Health Clinic, Wimborne, Dorset

G. B. HOPKINS, M.B., D.P.H., Medical Officer of Health, East Dorset Districts, and Senior Medical Officer, Dorset County Council

#### St. Mary's General Hospital, Portsmouth

J. V. T. GOSTLING, M.B., F.R.C.PATH., Consultant Virologist, Public Health Laboratory

#### R.A.F. Leconfield, Beverley, Yorkshire

IAN HILL, M.B., B.CHR., Flight Lieutenant (Formerly: Houseman, Liver Unit, King's College Hospital Medical School, London)

#### Ringwood & Fordingbridge R.D. Council, Christchurch, Hampshire

D. J. N. McNAB, M.B., D.P.H., Medical Officer of Health, S.W. Hampshire Districts, and Senior Medical Officer, Hampshire County Council

#### Salisbury Hospital Group, Salisbury General Infirmary, Salisbury, Wilts.

D. P. MULLAN, M.B., M.R.C.P., Consultant Physician

#### Royal Navy Hospital, Haslar, Hampshire

R. W. B. SCUTT, M.B., F.R.C.P., Surgeon Captain, Consultant Adviser in Dermatology to the Royal Navy

#### Department of Morbid Anatomy, King's College Hospital Medical School, London SE5 8RX

E. A. WRIGHT, M.D., F.R.C.PATH., Professor of Morbid Anatomy

criminating tattooing of a crucifix on the forearm as the probable source of the infection, though tattooing preceded onset by only about 30 days and obvious jaundice by only about 43 days. He had been tattooed with three companions on 6 May 1972, a date which was verified by association with the F.A. Cup Final. He was admitted to Salisbury Hospital with obvious jaundice on 19 June with a history of about two weeks' illness (D.P.M.) and he died on 10 August. Serum taken from him on 20 and 24 July contained Australia antigen but no antibody (gel and electrophoresis, J.V.T.G.).

There was no history of any other recent injections or tattoos, though he had been tattooed previously during the summer of 1971. The pathological diagnosis at necropsy (E.A.W.) was staphylococcal septicaemia associated with massive hepatic necrosis due to serum hepatitis. The liver (1,540 g) was of about normal size but showed a severely atrophied and shrunken left lobe and a nodular surface over the right lobe. Histologically the chief appearance was of almost complete necrosis with some regenerating nodules. There were also some areas of normal pattern with pronounced centrilobular necrosis. There were numerous acute purulent abscesses in the lungs, kidneys, and heart. The left ante-cubital vein contained a laminated organizing thrombus, in which Gram-positive cocci in grape-like clusters were present. Shortly before death a blood culture had been found positive for *Staphylococcus aureus*.

On 4 August one of us (D.J.N.M.) traced the three men tattooed in company with the victim and took blood from each which was examined at the Central Public Health Laboratory, Colindale (gel and electrophoresis). The two men first and second in order of tattooing had not previously been tattooed and were negative for Australia antigen and antibody. The third man, who immediately preceded the victim in order of tattooing, was Australia antigen positive and antibody negative. He had been tattooed nine times in all at Portsmouth, Southampton, Brighton, London, and Dorset. He gave no history of viral hepatitis and was in good health, but stated that he had been heavily jaundiced at birth. The tattooist himself was heavily tattooed, the most recent one two years previously, but his blood, taken on 4 October 1972, was Australia antigen negative and antibody negative (gel and electrophoresis, Central Public Health Laboratory, Colindale).

#### TATTOOIST'S PREMISES

The tattooist involved uses four electrically operated machines, one for each colour. They vibrate through an amplitude of about  $\frac{1}{16}$  in (1.6 mm), a solid detachable needle projecting a maximum of about  $\frac{1}{4}$  in (3 mm) through a fixed conical metal collar with a small clearance to avoid friction and allow free flow of pigment. The solution of pigments forms a small reservoir by capillary

attraction around the needle and within the collar and is replenished by dipping into the main supply like a pen into ink. After final use the machine is returned to a slot in a cabinet with the nozzle dipping in cetrimide solution to remove surplus pigment. The tattooist stated that before use the nozzle, with needle in situ, is dipped into spirit and flamed in a methylated spirit lamp.

The premises used by the tattooist left much to be desired. He was a relative newcomer to the district awaiting re-housing by the council, and had secured the tenancy of part of a cottage awaiting demolition. He occupied a "one up and one down" extension with his wife, two schoolgirls aged 12 and 10, and a baby. The downstairs room was divided by a partition into two sections, the larger section measuring only about 9 ft by 13 ft (2.7 m by 3.9 m) being both the living room and the tattooing parlour, congested with furniture, quite inadequate, and possessing no wash basin. The only water supply was an outside standpipe common to three families. A bucket type latrine was situated across an unkempt yard and was also shared by three families.

### Comment

If tattooing is to continue to be permitted, the conditions described reinforce the argument for minimum standards to be imposed on tattooists' premises, equipment, and methods—the practical difficulty being one of enforcement. That public health authorities are mostly powerless in this matter (cf. *British Medical Journal*, 1961), has recently been emphasized in a report from Scotland describing 16 cases of hepatitis after tattooing, all by the same tattooist (Mowat *et al.*, 1973). The only authorities in Great Britain which have bylaws requiring registration of tattooists are Portsmouth C.B. and Grimsby C.B., but the only national legislation, The Tattooing of Minors Act, 1969, which makes it illegal to tattoo persons under 18 years, is not concerned with registration and is infringed with impunity (Gostling, 1971, 1972).

No difficulty would be experienced in enforcing minimal structural standards and facilities for premises or the provision of suitable machines and sterilization equipment, but

effective use of the latter would be difficult to enforce. On balance it seems probable that many tattooists would use apparatus if they were obliged to purchase it.

Many tattoo machines are designed so as to permit the dismantling of the parts coming into contact with pigments, thereby permitting sterilization by an absolute method such as a domestic pressure cooker or a thermostatically controlled domestic oven. This makes it possible to provide sterilized units readily available for each successive client, no matter how long the queue. There would be little or no delay if the operator had a sufficient supply of collars and needle bars. Another obligatory improvement should be the provision of individually disposable or sterilizable palettes for each client. If, as seems likely, it proved impossible to enforce the disposal of excess pigment in each palette after each client (the price of pigments is a significant part of the costs of the operation), the formulation of the pigments and solvents should be such as to permit boiling or pressure cooking in an enclosed vessel as the only permissible alternative. Relevant research already published has shown that heat is the only practicable way to destroy the infectivity of the virus (Cossart, 1972). It is understood that most of the code of conduct outlined above is already followed by most tattooists in the U.S.A., and by a few of the more enlightened ones in Britain (Scutt, 1972).

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## Neonatal Rickets in Asian Immigrant Population

J. A. FORD, D. C. DAVIDSON, W. B. MCINTOSH  
 W. M. FYFE, M. G. DUNNIGAN

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Infantile rickets continues to occur in both the white and immigrant populations of the United Kingdom in an urban setting of poor socioeconomic circumstances (Arneil and Crosbie, 1963). Late rickets and osteomalacia in the Asian immigrant population is now recognized as a problem of numerically much greater magnitude (Dunnigan *et al.*, 1962; Ford *et al.*, 1972; Holmes *et al.*, 1973). Neonatal rickets in the offspring of Asian immigrant mothers with osteomalacia, though not unexpected, has not been hitherto described. We report two such cases below.

### Stobhill General Hospital, Glasgow G21 3UW

J. A. FORD, M.B., M.R.C.P., Senior Registrar in Paediatrics  
 D. C. DAVIDSON, M.B., M.R.C.P., Registrar in Paediatrics  
 W. B. MCINTOSH, F.I.M.L.T., Senior Technician  
 W. M. FYFE, M.D., F.R.C.P., Consultant Paediatrician  
 M. G. DUNNIGAN, M.D., F.R.C.P., Consultant Physician

### Case 1

A Pakistani woman aged 21 gave birth to a mature female infant weighing 3,000 g in July 1971. Pregnancy and delivery were uneventful. Seven days after birth the infant developed hypocalcaemic convulsions which responded to oral calcium chloride (fig. 1). Cessation of calcium chloride therapy led to a recurrence of the hypocalcaemia with further convulsions on one occasion. Seventeen days after delivery a raised level of serum alkaline phosphatase was noted (52 K.A. units/100 ml). One month after delivery the mother was found to have moderate biochemical osteomalacia. Thirty-seven days after delivery persisting hypocalcaemia and raised levels of serum alkaline phosphatase led to a revised provisional diagnosis of neonatal rickets. This was reinforced by the finding of amino-aciduria. After therapy with 1,000 I.U. of calciferol daily serum calcium levels showed a prompt and sustained rise to normal. Skeletal x-ray films at 5 months of age showed nothing abnormal, and at this time serum levels of calcium, inorganic phosphorus, and alkaline phosphatase were normal. The mother's osteomalacia showed a severe biochemical and clinical relapse in a subsequent pregnancy.

### Case 2

An Indian woman aged 22 gave birth to a male infant weighing 2,400 g four weeks prematurely in July 1972. Pregnancy and delivery were uneventful. At initial routine examination it was noted that the infant's parietal bones were soft and indented readily on palpation. No other skeletal abnormality was apparent and a skull x-ray film showed normal bone density with a somewhat thin calvarium. The child's progress was satisfactory but the parietal bones remained noticeably soft two weeks post partum. Further investigation then showed a serum calcium of 6.8 mg/100 ml, a serum inorganic phosphorus of 5.5 mg/100 ml, and a serum alkaline phosphatase of 70 K.A. units/100 ml. At this time the mother's serum calcium was 6.5 mg/100 ml, the serum inorganic phosphorus was 5.5 mg/100 ml, and the