tamicin and kanamycin. Blood culture also grew *E. coli* and *Staph. aureus*. Treatment with gentamicin and cloxacillin was started and within a few days the swelling of the knee abated and the baby started to move the leg. The tip of the big toe demarcated into dry gangrene, which separated on 9 May.

The antibiotics were stopped after four weeks when the leg appeared normal and *x*-ray examination showed that the infection had settled. The baby was discharged home on 18 May when 11 weeks old and weighing 3,410 g.

Comment

Prolonged umbilical vein catheterization may cause local thrombosis, umbilical vein phlebitis and pyaemia, liver necrosis, and pulmonary embolism (Scott, 1965). Portal hypertension (Thompson and Sherlock, 1964), bowel perforation (Corkery *et al.*, 1968; Orme and Eades, 1968), and myocardial infarction have also been documented (Van Der Hauwaert *et al.*, 1967). Umbilical artery catheterization has also been associated with a few complications. Gupta *et al.* (1968) reported complications in 10% of 335 babies, which included bleeding, clinical signs of arterial obstruction, and arterial thrombosis detected at necropsy. Cnly one baby lost the tip of the big toe. Cochran *et al.* (1968) reported complications in 8% of 387 babies. Gluteal muscle necrosis has been described (Ulan and Swyer, 1968).

The clinical picture in our two cases can be explained only by thrombosis induced by the catheter in the arterial tree with superimposed infection. When the catheters were removed multiple embolization must have occurred, affecting the skin, the big toe, and lower end of the femur. In the second case the infection was not controlled so suppuration became widespread. These are the only two cases with permanent sequalae in the 406 babies we have exchange transfused in the past four years.

We are grateful to Dr. B. Gans and Dr. C. A. Holman for permission to record these cases and for helpful advice and criticism. Our thanks are due to our resident pathologists for their help and to the nursing staff of the premature baby unit for their devoted nursing.

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Hepatorenal Damage from Toluene in a "Glue Sniffer"

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"Glue sniffing" is generally regarded as a relatively harmless practice and consequently little attention has been paid to the isolation of a toxic agent from the variety of substances used. The following report shows that "glue sniffing" may cause serious organ dysfunction and describes the isolation of the offending substance from the patient's blood.

Case Report

A 19-year-old boy arrived home in an emotional state and was brought to the casualty department by his mother. He had spent six hours that evening sniffing a proprietary brand of liquid cleaner from a rag. He had also had 3 pints (1·7 litres) of beer. He had begun the practice of "glue sniffing" three years earlier while employed as an apprentice in the sign-writing trade. He came from a reasonably happy home but did not get on very well with his father. There was no history of previous illness but he had noticed a reduced urinary output after sniffing episodes and on occasions he had not passed urine for two and a half days. He had received psychiatric attention for one year.

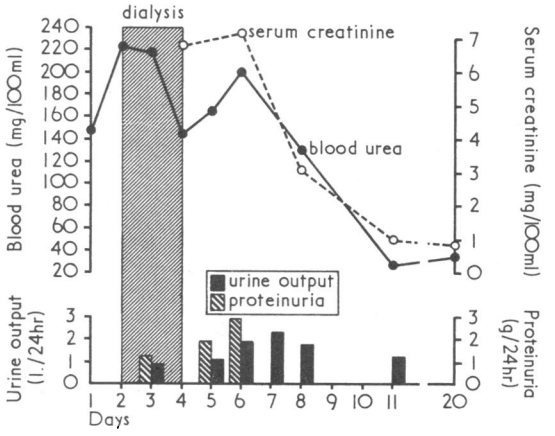

FIG. 1—Renal function tests.

On examination he was a thin, intelligent, co-operative youth who appeared alert and orientated. There was a strong smell of "cleaner" from his breath. He was vomiting dark brown fluid. Blood pressure was 140/90 mm Hg, pulse 110 per minute, and temperature 100°F (37·8°C). General physical examination was otherwise normal. Eight hours after admission he developed

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periorbital oedema and large subconjunctival haemorrhages. He was still vomiting and was amnesic for some events of the previous evening. At 36 hours an odour of cleaner still came from his breath. The subconjunctival haemorrhages were more pronounced. Prothrombin time was 20 sec (control 12 sec), the blood pressure was 160/90 mm Hg, and he had been anuric since admission. He was transferred to the renal unit, where peritoneal dialysis was begun and continued for 40 hours. He passed 800 ml of blood-stained urine, and thereafter his urinary output remained above 1 litre per day (Fig. 1). He was jaundiced, with a raised serum bilirubin (Fig. 2). The jaundice gradually disappeared and renal function returned to normal.

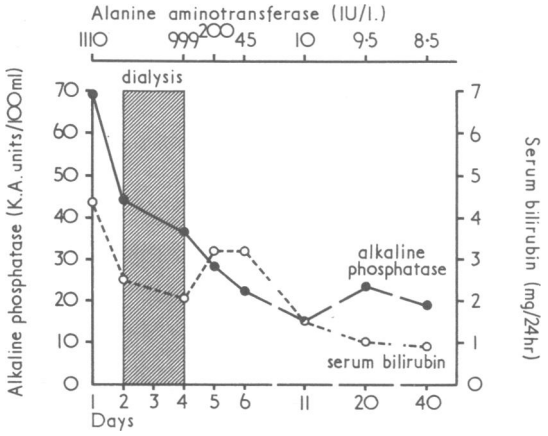

FIG. 2—Hepatic function tests.

The renal and hepatic function tests are presented in Figs. 1 and 2. Six months after discharge haematological and biochemical tests of renal and hepatic function were normal, except for the alkaline phosphatase, which remained slightly raised (21·2 K.A. units/100 ml). He was then asymptomatic, had gained 6 kg in weight, and was no longer "glue sniffing."

Infrared spectroscopy of the liquid cleaner and authentic toluene showed that the principal component was toluene (about 80% v/v), with additional bands at 1,740, 1,390, 1,240, and 980 cm^{-1} not positively identified. It seemed that the 1,740 and 1,240 cm^{-1} bands might arise from an ester molecule (C-O linkages).

Gas Chromatography.—A Pye 104 gas chromatograph was used. Chromatographic separations were performed with 3% S.E. 30 on 80-100 mesh Chromosorb W AWHMDS. Five microlitres of the cleaner were injected and a temperature programme instituted from 35°C at an increase of 1°C per minute. Twelve peaks were obtained; many of these represented components in very small concentration, the major component being toluene. Serum from the patient's blood was extracted with an equal volume of pure ether and 5 µl of the mixture examined under the same conditions of temperature programming. A similar experiment was performed with a 1 in 10 dilution of the proprietary substance in ether. One peak was found in common from the two chromatographs, and this corresponded with that due to toluene in the reference preparation (Fig. 3). The concentration of toluene in the serum was assayed by triangulation at 160 p.p.m.

Comment

"Glue sniffing" is generally thought to cause little harm physically (Massengale *et al.*, 1963). Many of the products used for sniffing, however, contain a large variety of toxic substances in different combinations, and it would not be surprising if toxic effects did occur. The toluene caused serious but apparently reversible renal and hepatocellular toxic effects. It is possible that the haemorrhagic events observed were due to the prolonged prothrombin time.

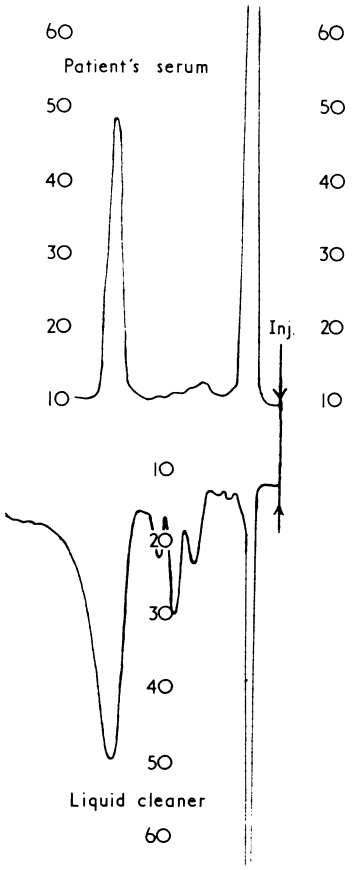

FIG. 3—Comparative gas chromatography of patient's blood and liquid cleaner. The chromatogram of the cleaner is inverted with respect to that of the patient's blood.

It is worth emphasizing that initially there were no abnormal physical signs, the patient being in fact admitted for psychiatric assessment. The unexpected development of a hepatorenal syndrome demonstrates the importance of close observation of such patients.

We wish to thank Dr. A. Paton, Dr. J. D. Blainey, and Mr. P. Dawson-Edwards for their help and advice.

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