very early onset in our patient was unusual. The direct pressor effect of angiotensin II was probably responsible, since an infusion of angiotensin II producing plasma concentrations lower than those seen here raises arterial pressure in normal subjects.⁴ The restoration of normal blood pressure and plasma renin, angiotensin II, and aldosterone concentrations by nephrectomy indicates that the damaged kidney was the source of excess renin.

Interestingly, we have found only one other case of traumatic renal thrombosis in which the renin-angiotensin system was studied from the time of injury.² Plasma renin and aldosterone concentrations were raised from the third day, although hypertension was not detected for 13 weeks and was mild. Because the delayed onset of hypertension in the patient excluded a direct vasoconstrictor effect other renin-induced mechanisms were considered to be responsible.² Such slower-developing pressor effects of angiotensin are well recognised.⁵

We thank Dr A Armstrong, Dumfries Royal Infirmary, who referred this patient to us.

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Simplified banking of human milk

We have developed a simple milk-banking system that avoids capital outlay and extra staff and may be adopted by any unit caring for preterm infants. We report the results of a preliminary study assessing the safety of this technique.

Materials, methods, and results

Twenty women donated 100 ml of breast milk at a single expression using a hand breast pump (Kaneson) sterilised in 1% sodium hypochlorite solution. The nipple and areola were cleaned using sterile water. Milk obtained from each donor was divided into three aliquots: the first was sent for immediate analysis while the second and third were poured into sterilised bags, sealed, and frozen at -20°C in a domestic freezer. The bags were constructed of laminated nylon and polyethylene, and a Teflon tape seal was used. Elution of organic and inorganic compounds into the milk was prevented by the nylon layer, and the combination with polyethylene ensured a robust container that would withstand freezing and thawing without damage.¹

The second and third aliquots were thawed at one week and one month respectively. Milk was removed from each bag by wiping one corner with an alcohol swab and cutting with a pair of clean scissors. The three aliquots from each donor were compared for bacterial contamination, bacteriostatic activity, cellular and immunological components, fat, and amino-acids.

Colony counts were performed on 100 μl samples added to 10 ml of plate-count agar incubated for 48 hours. Blood agar 02 and McConkey agar were used. Bacteriostatic activity was tested on milk supernatant after centrifugation at 56 000 g and 4°C for 40 minutes. *Escherichia coli* 0111 was inoculated into each sample after sterilisation through a 0.45 oxid filter (n47/45), and a viable count was performed immediately and at hourly intervals for seven hours.²

Cell counts were performed on 200 μl samples stained with 0.2% gentian violet and diluted with saline using a standard blood cell count technique. Cell viability was tested with trypan blue dye (C Rolles, personal communication) on a pellet of cells resuspended in 0.3 ml of Hanks's balanced salt solution after centrifugation at 700 g for 15 minutes.

The table shows that there was no appreciable change in bacterial counts in the fresh and stored samples. Counts were higher when expression had been prolonged or difficult. No pathogens were isolated from any of the samples. Most samples (80%) contained less than 2.5×10^6 colony forming units of *Staphylococcus albus*/l. Bacteriostatic activity was preserved for at least one week by freezing. Some deterioration occurred during storage for one month, but this was less than that caused by pasteurisation: in an unpublished study we showed that bacteriostatic activity was destroyed by pasteurisation at 63.5°C for 30 minutes. A surprisingly large number of cells in our samples survived storage. Many of the surviving cells remained viable. Cell loss appeared to be related to freezing and thawing rather than the period of storage.

Cell survival and preservation of antibacterial proteins may be enhanced by fast freezing and thawing. In our bags 10 ml milk freezes after 35 minutes, but a similar volume in a standard glass bottle freezes after 57 minutes.

Bacterial and cellular analysis of tested milk samples

	Fresh	Frozen	
		1 week	4 weeks
No of samples	20	20	20
Median bacterial counts ($\times 10^6$ colony forming units/l)	1.25	0.97	1.25
Growth rate of <i>E coli</i> (Log organisms/l/h)	0.88	0.98	1.19
Median cell counts ($\times 10^6$ /l)	3500	1900	1300
Mean viability as % of total count	86.0	47.7	44.6
Mean viability as % of counts in fresh milk	86.0	26.1	18.9

Comment

Our system of milk banking is safe and reliable and preserves more of the antibacterial and nutritional components of breast milk than has hitherto been reported. Each storage bag costs less than 5p, including sealing tape and labels. This system allows a mother to provide enough milk for her own infant. Milk from a single expression at home or hospital is divided into single-feed volumes, sealed in the bags, and frozen immediately. A 1 ml aliquot may be retained for bacterial quality control. The milk is stored until the sample has passed the criteria of Carroll *et al.*³ Single feeds are thawed immediately before use to prevent contamination and waste. Milk may be stored at home until transferred frozen to the hospital freezer. There is minimal handling of milk by donors and staff.

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