In both the Tromsø and the Wairoa studies, therefore, there is a strong presumption that the lipoproteins in the plasma at the time of analysis were not those present when blood was drawn. In the Tromsø study, specimens from both patients and controls had been frozen, but we still cannot be sure that the differences observed accurately reflect, either quantitatively or qualitatively, any differences that were originally present. The attempt to validate the storage procedure by a test of two months' duration lacks conviction because the trial lasted much longer than this.

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⁂This letter has been shown to Dr Miller, whose reply follows.—ED.L.

SIR,—We were aware of the evidence cited by Dr Mills that freezing plasma alters the electrophoretic mobility and ultracentrifugal properties of its lipoproteins. This was why neither electrophoresis nor preparative ultracentrifugation were used in the Tromsø Heart Study[1] for the measurement of high-density-lipoprotein (H.D.L.) cholesterol concentration, and why the heparin/manganese-chloride method was used instead. In our hands freezing plasma for two months had no effect on the result obtained by this method.[1] We further showed (unpublished) that repeated freezing and thawing (three times) was also without effect on H.D.L.-cholesterol concentration. Clearly, the possibility that important changes may occur during longer periods of storage cannot be completely excluded. The plasma samples used in our study had been collected and stored under identical conditions, however, and it seems unlikely that any such changes would have occurred differentially in samples collected from future cases or controls.

Our conclusion concerning the predictive power of H.D.L.-cholesterol concentration in relation to coronary heart-disease is strongly supported by the results of a prospective analysis reported by the Framingham group.[2] In a follow-up of approximately 2500 men and women who were free of clinical coronary heart-disease at the 11th biennial examination of the Framingham Study, the plasma-H.D.L.-cholesterol concentration again emerged as the most powerful lipid risk factor.

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TRANSMISSION OF SALMONELLA TYPHI BY FIBEROPTIC ENDOSCOPY

SIR,—A 33-year-old man was admitted to hospital for upper-gastrointestinal hæmorrhage; fever developed on the seventh hospital day, and *Salmonella typhi,* phage type E_1, was isolated from his blood and stool. His symptoms on admission were those of upper gastrointestinal bleeding without fever (i.e., not typhoid), and the diagnosis of duodenal ulcer was confirmed endoscopically.

During the same week *S. typhi,* phage type E_1, was also recovered from blood and stool cultures of a 40-year-old man admitted to the same hospital with fever and lower gastrointestinal bleeding. In retrospect, he undoubtedly had had typhoid fever on admission.

The two patients were on separate floors with different nurses, but on the same day both had undergone gastroduodenoscopy with the same fiberoptic endoscope. The instrument was used for the typhoid patient; it was rinsed and irrigated with water containing a hexachlorophane soap before being used to investigate the patient with the bleeding duodenal ulcer.

1. Miller, N. E., Førde, O. H., Thelle, D. S., Mjøs, O. D. *Lancet,* 1977, i, 965.
2. Gordon, T., Castelli, W. P., Hjortland, M. C., Kannel, W. B., Dawber, T. R. *Am. J. Med.* 1977, **62,** 707.

S. typhi was probably transmitted from the duodenum of the typhoid patient to the second patient by the endoscope. Direct duodenal inoculation and buffering by blood in the patient's stomach at the time of endoscopy may have reduced the number of organisms necessary to cause symptoms to less than the 10^5 found by oral inoculation of volunteers.[1]

Other routes of infection were considered, including a blood-transfusion received by the first patient on admission which resulted in transient chills and fever. Culture of the remaining blood was negative. The donor of the blood denied any history suggesting typhoid fever or *Salmonella* infection and her serum was Widal negative.

Fiberoptic instruments are not easy to sterilise quickly, and in many centres those used in the gastrointestinal tracts are merely cleaned between patients. One textbook on endoscopy[2] suggests that fiberoptic endoscopes used for the examination of the gastrointestinal tract need not be sterilised routinely while another[3] concludes that the risk of cross-infection is "perhaps theoretical rather than practical". *Pseudonomas* and *Salmonella* infections have been associated with gastrointestinal endoscopy, but such reports are rare.[4,5]

Although the likelihood of typhoid transmission by endoscopy in the U.S. is very low, hepatitis and other enteric infections do pose a threat. The use of ethylene oxide gas, glutaraldehyde, or 20% formalin and hours of contact-time for sterilisation of instruments[6] reduces this risk but may also require purchase of additional expensive and otherwise unnecessary endoscopes. Careful attention to scheduling of endoscopy as well as thorough cleaning with the best available disinfectants and longest practical contact-times should help to reduce the risk of iatrogenic infection until better methods of sterilisation are developed.

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PLASMAPHERESIS AND PLASMA-CHOLINESTERASE

SIR,—Dr Wood has clearly demonstrated falls in plasma-cholinesterase after plasma exchange.[7] However, in implying that these changes might be responsible for prolonged apnœa in a patient with Goodpasture's syndrome he neglects certain facts. First, the patient that he describes had not had an effective plasma exchange before the operation (hence the need for the procedure); approximately 500 ml of plasma had been removed 12 h previously and this would reduce the level of intravascular marker by about 20% and even less for plasma-cholinesterase which has a larger volume of distribution. Secondly, besides suxamethonium, the patient also received pancuronium (6 mg) for a procedure that lasted 20 min; and thirdly, although anuric with acute renal failure, she received an excessive volume of intravenous fluid during the operation.

Immediately postoperatively there was clinical and radiological evidence of pulmonary œdema and of recurrence of pulmonary hæmorrhage; her ventilation was also depressed. These circumstances determined the need for positive-pressure ventilation and in addition to this a 4 litre plasma exchange was performed in an attempt to reduce fluid volume rapidly,

1. Hornick, R. B., Greisman, S. E., Woodward, T. E., DuPont, H. L., Dawkins, A. T., Snyder, M. J. *New Engl. J. Med.* 1970, **283,** 686.
2. Salmon, P. R. Fibre-Optic Endoscopy; p. 83. London, 1974.
3. Berci, G. (editor) Endoscopy; p. 172. New York, 1976.
4. Greene, W. H., Moody, M., Hartley, R., Effman, E., Aisner, J., Young, V. M., Wiernik, P. H. *Gastroenterology,* 1974, **67,** 912.
5. Chmel, H., Armstrong, D. *Am. J. Med.* 1976, **60,** 203.
6. Slotnick, I. J. *in* Endoscopy (edited by G. H. Berci); p. 155. New York, 1976.
7. Wood, G. J. *Lancet,* 1977, i, 1305.