

2. Starzl TE, Koep L, Porter KA, et al. Decline in survival after liver transplantation. *Arch Surg* 1980; 115: 815
3. McGregor RS, Zitelli BJ, Urbach AH, Malatack JJ, Gartner JC. Varicella in pediatric orthotopic liver transplant recipients. *Pediatrics* 1989; 83: 256.
4. Demetris AJ, Lasky S, Van Theil DH, Starzl TE, Dekker A. Pathology of hepatic transplantation. *Am J Pathol* 1985; 118: 151.
5. Cordell JL, Falini B, Erber WN, et al. Immunoenzymatic labeling of monoclonal antibodies using immune complexes of alkaline phosphatase and monoclonal anti-alkaline phosphatase (APAAP complexes). *J Histochem Cytochem* 1984; 32: 219.
6. Feldman S, Hughes WT, Daniel CB. Varicella in children with cancer: seventy seven cases. *Pediatrics* 1975; 56: 388.
7. Morgan ER, Smalley LA. Varicella in immunocompromised children. *Am J Dis Child* 1983; 137: 883.
8. Shulman ST. Acyclovir treatment of disseminated varicella in childhood malignant neoplasms. *Am J Dis Child* 1985; 139: 137.
9. Ey JL, Smith SM, Fulginiti VA. Varicella hepatitis without neurologic symptoms or findings. *Pediatrics* 1981; 67: 285.
10. Ludwig J, Wiesner RH, Batts KP, Perkins JD, Krom AF. The acute vanishing bile duct syndrome (acute irreversible rejection) after orthotopic liver transplantation. *Hepatology* 1987; 7: 476.
11. Balfour HH. Intravenous acyclovir therapy for varicella in immunocompromised children. *J Pediatr* 1984; 104: 134.
12. Nyerges G, Meszner Z, Gyarmati E, Kerpel-Fronius S. Acyclovir prevents dissemination of varicella in immunocompromised children. *J Infect Dis* 1988; 157: 309.

Received 4 August 1989.

Accepted 30 August 1989.

1054

STERILITY OF BILE IN MULTIPLE-ORGAN DONORS¹

When liver removal is part of a multiple-organ procurement, bile in a liver donor is usually washed out of the biliary tree to prevent autolysis of the bile duct mucosa during cold storage (1). During the "lavage," bile is spilled in the peritoneal cavity. The possibility that this bile is infected has often concerned surgeons removing the kidneys, heart, or other organs. Consequently, we undertook a bacteriologic study to see if flushing of the biliary system introduced a potential source of contamination of other organs.

During a 12-month period from April 24, 1988 to April 28, 1989, 438 hepatic allografts were procured from brain-dead donors in North America by the University of Pittsburgh Transplantation Service. Bile was obtained for culture from 121 (28%) of these donors. The selection of cases was random and based primarily on the cooperation of donor surgeons. The age of the donors in this study ranged from 8 to 55 years (mean 28.3). Eighty-three (69%) were male. The cause of death was head trauma in 98 donors (blunt trauma in 75 and gunshot in 23), subarachnoid hemorrhage in 17, and anoxia in 6. The length of hospital stay was 1-16 days (mean 4.3). Forty-three donors (36%) had undergone cardiopulmonary resuscitation and 57 (47%) were on more than 5 µg/min/kg of dopamine i.v. The techniques for donor hepatectomy are described elsewhere (1, 2). During preliminary dissection of the hepatic hilum, the common bile duct was divided and hepatic bile was allowed to escape. In addition, a small incision was made in the fundus of the gallbladder through which gallbladder bile was washed out using a bulb syringe.

Just before making the cholecystotomy, approximately 5 ml of bile was aspirated from the gallbladder with a sterile syringe. The bile specimens were placed in sterile containers and brought back to the Microbiology Laboratory of the Presbyterian University Hospital of Pittsburgh. Each specimen was cultured aerobically on sheep blood sugar, Columbia colistin-nalidixic acid agar, eosin methylene blue agar, Trypticase broth, and thioglycolate broth. Anaerobic cultures were made on colistin-nalidixic agar and CDC anaerobic blood agar, and fungal

¹This work was supported Research Grants from the Veterans Administration and Project Grant AM29961 from the National Institutes of Health, Bethesda, MD.

cultures were made on mycosel and Sabouraud dextrose agar. Cultures were incubated at standard conditions and the final culture reports were read at seven days.

No microorganisms grew from any of the 121 donor bile specimens. These results provide assurance about the safety of liver removal during multiple organ procurement. In addition, the data are helpful in assessing the genesis of the cholangitis that occurs in 5-10% of recipients after transplantation (3). Theoretically, contaminated bile transmitted by the donor's liver could have caused this kind of complication. However, the universal sterility of donor bile in our study indicates that donor bile usually is not the source of biliary contamination in the recipient. If colonization or cholangitis occur, it must be with recipient flora.

TETSUO IKEDA
KATSUHIKO YANAGA
SHIMON KUSNE
JOHN FUNG
HIDEFUMI HIGASHI
THOMAS E. STARZL²
*The Departments of Surgery and Medicine
University Health Center of Pittsburgh
University of Pittsburgh
The Veterans Administration Medical Center
Pittsburgh, Pennsylvania*

² Address correspondence to: Thomas E. Starzl, M.D., Ph.D., Department of Surgery, University of Pittsburgh School of Medicine, Falk Clinic 5C, 3601 Fifth Ave., Pittsburgh, PA 15213.

REFERENCES

1. Starzl TE, Hakala TR, Shaw BW Jr, et al. A flexible procedure for multiple cadaveric organ procurement. *Surg Gynecol Obstet* 1984; 158: 223.
2. Starzl TE, Miller C, Broznick B, et al. An improved technique for multiple organ harvesting. *Surg Gynecol Obstet* 1987; 165: 343.
3. Kusne S, Dummer JS, Singh N, et al. Infections after liver transplantation. *Medicine* 1988; 67: 132.

Received 4 August 1989.

Accepted 25 August 1989.