CASE REPORTS

Presumed Transmission of Salmonella by Sigmoidoscope

HAROLD E. PEARSON, M.D., AND
WILLIAM J. GRANT, M.D., *Los Angeles*

SIGMOIDOSCOPY IS A common procedure in hospitals and clinics. It is accepted as part of physical examinations and is recommended as a routine office procedure. The potential hazard of transmission of enteric pathogens by use of a sigmoidoscope is generally recognized but actual accidental spread of infectious agents in this manner has not been reported. The present report describes what is presumed to be transmission of Salmonella by way of a sigmoidoscope used to examine two patients from different medical wards in a general hospital.

Report of Patients

Patient A, a diabetic woman 64 years of age, in a state of ketoacidosis, was admitted 22 April 1968 to a diabetic ward for treatment of osteomyelitis of one foot (*S. aureus,* Proteus) which developed after a hot water burn. She also had chronic heart failure, pneumonitis, a urinary tract infection *(E. coli),* and fecal impaction. On 30 April the affected leg was amputated above the knee. At that time the patient had a small sacral decubitus ulcer. Four days later, because of constipation she was given an enema (disposable type) and a large stool was voided. On the following day she complained of rectal pain and was incontinent of blood-flecked feces. In the course of examination on the diabetic ward, the ward sigmoidoscope was used. Biopsy of a specimen of rectal mucosa showed acute and chronic inflammation. A rectal stricture was thought to be present. Three days later, 8 May, the patient was taken to the medical ward for examination and the sigmoidoscope available there was used. Culture of material swabbed from the rectum immediately after the procedure grew *Salmonella lomita.* The mucosa was friable but no focal lesion or stricture was seen. On 10 May a barium enema study was suggestive of segmented colitis. On 11 May (hospital day 19) when results of the culture were known, the patient was transferred to the Communicable Disease Service. She now had a large, unilateral pleural effusion. During the next ten days, without any antibacterial treatment, she had six stool cultures on different days, all of which yielded Proteus; none yielded Salmonella. Fecal incontinence recurred.

The patient was returned to the diabetic ward 29 May and she died 12 days later. Autopsy diagnoses were pulmonary emboli, pulmonary abscess *(Proteus, E. coli),* large sacral decubitus ulcer *(Proteus, E. coli),* acute and chronic colitis.

Patient B, a Negro man 71 years of age, entered a medical ward on 4 May 1968 with complaint of cramping abdominal pain and diarrhea for seven days. Dysuria and decreased urine flow had been noted during the preceding month. Examination revealed slight left lower quadrant tenderness and poor rectal sphincter tone. The patient was dehydrated, anemic and incontinent of feces. A urethral stricture was noted. The serum urea nitrogen was 290 mg per 100 ml. *E. coli* and nonhemolytic streptococci, each fewer than 1,000 per ml, were present in urine obtained by catheterization. On 6 May the medical ward sigmoidoscope was used in examination of the patient. Fecal impaction was tentatively diagnosed. Three days

From the Los Angeles County-University of Southern California Medical Center and the Departments of Microbiology and Medicine, University of Southern California School of Medicine, Los Angeles.

Submitted 8 July 1969.

Reprint requests to: 1200 North State Street, Los Angeles, Ca. 90033 (Dr. Pearson).

TABLE 1.—*Sequence of Events Involving Patients A and B*

	Diabetic Ward	*Medical Ward*
4/22/68	Patient "A" admitted Urine: *E. coli* Osteomyelitis foot: *S. aureus Proteus*	
4/30	Amputation, foot	
5/4		Patient "B" admitted Enteritis, urethral stricture
5/5	Sigmoidoscopy Rectal biopsy	Urine: *E. coli*
5/6	Another patient sigmoidoscoped Lost to follow-up	Sigmoidoscopy
5/8	Patient to Medical Ward for sigmoidoscopy Rectal swab: *S. lomita*	→
5/9		Urine: *S. lomita* Beta streptococci
5/11		Another patient sigmoidoscoped Lost to follow-up
5/13		Sigmoidoscopy Fecal specimen: *S. lomita*
5/15-5/25	Stool culture: Proteus	
5/20-5/27		Stool culture: *S. lomita* Discharged home
6/8	Died	

later, *Salmonella lomita* (more than 10^5 bacteria per ml), beta streptococci (less than 10^3 per ml) and nonhemolytic streptococci (10^3 to 10^5 per ml) were cultured from the urine. Four days later on 13 May (hospital day 10), the patient was again examined and the same sigmoidoscope was used. Culture of the fecal specimen obtained during examination yielded *S. lomita*. On 15 May he was transferred to the Communicable Disease Service. Three more stool specimens obtained during the next week yielded *S. lomita*. The patient was discharged to his home on hospital day 24.

Patient B lived with relatives. Patient A lived alone in an apartment. She drank raw milk. Investigation by the health department did not reveal any additional persons infected with Salmonella or other identified source of infection.

The sequence of events described above is outlined in Table 1. The only thing discovered in common for the two patients was exposure to the same sigmoidoscope on the medical ward. The instrument was used for patient B on 6 May and 13 May. *S. lomita* was recovered from stool obtained on the latter date but already had been found in large numbers in the patient's urine on 9 May and after 13 May was repeatedly found in stool specimens. The same sigmoidoscope was used for patient A on 8 May, at which time *S. lomita* was recovered from a rectal swab. Subsequent stool cultures did not yield this organism.

After use, the sigmoidoscope on the medical ward had been washed with 5 percent Amphyl® (phenols) and then soaked for an unknown period, supposedly 20 to 60 minutes, in 2 percent Staphene® (phenols) after which it was washed with water.

S. lomita has not previously been identified during the past six years in this hospital nor in the four-year period in Los Angeles County for which records of Salmonella serotypes have been kept. The immediate source of the organism is unknown.

Discussion

The only environment common to the two patients was the hospital. The only potential mechanism for the transfer of infection discovered in the environment was the sigmoidoscope used for both patients on the medical ward. It was also used for a third patient, lost to follow-up, subsequent to initial use for the two patients who were infected.

Patient B entered the hospital with enteritis. After sigmoidoscopy, *S. lomita* was recovered from his urine and repeatedly from his stools. Possibly the sigmoidoscope was the source of this infection for him. The only isolation of *S. lomita* from Patient A was from a rectal swab taken immediately after sigmoidoscopy on 8 May. The sigmoidoscope was a potential source for the bacteria.

The easiest answer to the problem of disinfection of endoscopes is a disposable instrument. If reused instruments are to be disinfected, the only reliable procedure is autoclaving. Exposure to temperature of 85°C will kill most pathogenic microorganisms[1]; destruction of hepatitis virus at this temperature is not certain.

The American Hospital Committee on Infections Within Hospitals suggests that heat-labile endoscopes be disinfected with glutaraldehyde, formaldehyde solution or ethylene oxide gas.[2] For chemical disinfection of *clean* lensed instruments, immersion in 2 percent activated glutaraldehyde for ten minutes may be used, or three hours for spores, but "all articles which may carry hepatitis virus should be heat-sterilized."[5] Glutaraldehyde

destroys bacteria including mycobacteria, some viruses[3] and bacterial spores,[4] but its activity for hepatitis virus is unknown. Ethylene oxide gas can destroy bacteria, mycobacteria, bacterial spores and various viruses.[6] It must be realized that irregularities in sterilization can occur with this gas.[2,7] Its action on human hepatitis virus is unknown.

The most readily available recommendations for sanitation of sigmoidoscopes are those given in brochures distributed by manufacturers of these instruments. It is suggested that our distally illuminated instrument (Welch Allyn) can be sterilized by boiling the outer tube and obturator; the inner tube containing a lamp and electrical connection should be washed with soap and water, then wiped with alcohol. Fiber optic models can be exposed to gas sterilization or chemical cold sterilization (except Lysol® compounds). American Cystoscope Makers suggest cleaning, then immersion in a 1:1,000 quaternary ammonium compound, for instruments that do not have fiber optics. The latter, after cleaning, are washed or swabbed with the quaternary solution or 50 percent alcohol. Both manufacturers also have autoclavable fiber optic models.

Mycobacteria are resistant to quaternary ammonium compounds; certain bacteria, particularly Gram-negative ones such as Pseudomonas and Proteus, tend to be resistant; bacterial spores are resistant.[2,8,9] The sensitivities of human hepatitis viruses are unknown. Quaternary ammonium compounds are inadequate for disinfection of endoscopic instruments and should not be used for this purpose. At present the only method proved reliable is autoclaving. The alternative is a disposable instrument.

TRADE NAMES AND GENERIC INGREDIENTS

Amphyl®.....phenols, ricinoleate, propylene glycol and alcohol
Staphene®.....phenols, isopropanol, tetra-acetate and laurate
Lysol®.....soap, glycol, xylenols and acohol

REFERENCES

1. Dineen P: The sterilization of endoscopic instruments. JAMA 176:772-775, Jun 3, 1961
2. Infection control in the hospital. Amer Hosp Assoc. Chicago, 1968
3. O'Brien HA, et al: The use of activated glutaraldehyde as a cold sterilizing agent for urological instruments. J. Urol 95:429-435, Mar 1966
4. Rubbo SD, Gardner JF, and Webb RL: Biocidal activities of glutaraldehyde and related compounds. J App Bact 30:78-87, Apr 1967
5. Environmental aspects of the hospital. Vol. 1, infection control. U.S. Dept HEW Pub Health Service Pub No 930-C-15, 1966
6. Bruch CW: Gaseous sterilization. Ann Rev Microbiol 15:245-262, 1961
7. Royce A, and Bowler C: Ethylene oxide sterilization—some experiences and some practical limitations. J Pharm Pharmacol 13: Suppl 87-94, Dec 1961
8. Kalinske RW, et al: Cold sterilization of ureteral catheters with ethylene oxide gas. J Urol 93:31-35, Jul 1966
9. Pearcy M: Cold sterilization of urologic instruments: An in vitro study of neomycin, detergicide and urolocide. J Urol 84:439-441, Aug 1960

WHAT KIND OF ORAL CONTRACEPTIVE?

"I want to . . . point out that there should be no blanket favoritism for any one oral contraceptive drug over another, that one must individualize for a given patient. If you have a thin patient who wants to gain weight, you give her a combination with lots of estrogen and lots of progestin in it; if you have a girl who has hypomastia and thinks she could stand a little improvement, you try to give her a pill with lots of estrogen and not too much progestin in it; if she's got hypermenorrhea, a combination is preferable to a sequential; if she tends to hypomenorrhea or amenorrhea, a sequential is preferable."

—JOSEPH W. GOLDZIEHER, M.D., San Francisco
Extracted from *Audio-Digest Obstetrics and Gynecology*, Vol. 16, No. 2, in the Audio-Digest Foundation's subscription series of tape-recorded programs.