

Editorial

Nosocomial Salmonellosis and Shigellosis

Herbert L. DuPont, MD

In this issue of *Infection Control and Hospital Epidemiology*, Paton et al¹ report the results of a six-month study of the occurrence of *Salmonella* and *Shigella* infection determined by routine rectal swab culturing of patients either admitted to a large acute and tertiary care hospital in Nairobi, Kenya, or experiencing a nosocomial episode of acute diarrhea during a six-month period of time at the same institution. The background infection rate for 667 sequentially admitted patients was approximately 3% for both agents. *Salmonella* infection at the time of admission was seen only in the children under 13 years of age. These infected children were older and were found more commonly to have clinical indication of malnutrition than culture-negative children. Diarrhea was more common as a presenting finding in the culture-proven cases. The high background rate of infection undoubtedly reflected the low socioeconomic level and underlying health of the population served by this hospital where evidence of malnutrition and previous administration of antimicrobials in the previous month were seen in 26% and 66% of children, respectively. *Salmonella* was recovered from 10% of 360 nosocomial diarrhea cases, while *Shigella* infection in these cases occurred no more commonly than in the patients admitted to the hospital.

A hospital-based survey of a specific infection over a restricted period of time (in this case, six months) can yield data with only limited application to other settings. A few findings in the study were of

interest, however, and should stimulate further study in this institution as well as others. The authors clearly documented the occurrence of nosocomial salmonellosis. They provided evidence that at this institution, the epidemiology of nosocomial salmonellosis shows some difference between children and adults. Prior use of antimicrobial agents, presence of clinical markers of malnutrition, and coming from more crowded homes were important to the occurrence of nosocomial salmonellosis in the children. Although values of significance were not quite reached, *Salmonella* infection in adult cases of nosocomial diarrhea appeared to more commonly be associated with serologic evidence of human immunodeficiency virus (HIV) infection than with prior hospitalization in the last month. The major similarity in both children and adults was that both commonly had preexisting host health impairment (malnutrition, crowding, HIV infection, or previous hospitalizations).

In considering the problem of diarrhea occurrence after hospitalization, it is important to make a distinction between hospital-associated diarrhea and nosocomial infectious diarrheal disease.² Diarrhea occurring in the hospital is either the first or the second most common nosocomial illness, and it often is not infectious in origin. Changes in body flora, medication, and tube feedings are important causes of diarrhea in the hospital. In the case of infectious diarrheal disease, there are important causes of diarrhea in the hospital. In the case of infectious diarrheal

From the University of Texas Medical School and School of Public Health, Houston, Texas.

Address reprint requests to Herbert L. DuPont, MD, Medical School and School of Public Health, Center for Infectious Diseases, 6431 Fannin, 1.729JFB, Houston, TX 77030.

DuPont HL. Nosocomial salmonellosis and shigellosis. *Infect Control Hosp Epidemiol.* 1991;12:707-709.

disease, there are important differences when compared with other nosocomial infections. Nosocomial infectious diarrheas typically represent exogenously acquired infections. Clustering of cases commonly occurs, and healthy patients and hospital personnel may become infected. Even though the causative agents of infectious diarrhea are characteristically high-grade pathogens, age and debility can predispose to infection as seen in the Nairobi study. The frequency of nosocomial infectious diarrheal disease is unknown, because most cases are not documented nor worked up for cause. The actual incidence is far greater than evidence would suggest. The mode of spread characteristically is the fecal/oral route by cross infection. Patients typically acquire the organism indirectly from another patient via hands of hospital personnel. Occasional outbreaks occur following exposure to contaminated food, medication, or test reagent.

Salmonella species, while not the most common cause of nosocomial infectious diarrhea, represent occasional causes in all areas of the world. Between 10% and 30% of the reported cases of *Salmonella* infection in the United States occur in institutions (hospitals, nursing homes, and custodial institutions). These outbreaks only account for 1% of reported cases, however, because the average institutional outbreak involves six persons, compared with noninstitutional outbreaks of salmonellosis involving an average of 69 persons. It is believed that nosocomial infection is more common in the developing world.^{3,4} In previous publications, hospitals in developing regions have been shown to be important reservoirs for the transmission of multiresistant *Salmonella*, where receipt of prior antimicrobials, young age, and debilitation in addition to hospitalization have predisposed to infection.^{3,4} Fifty percent of nosocomial cases of salmonellosis reported in the United States occur in newborn nurseries and pediatric wards. The newborns who have a predilection for disease have a high rate of bacteremia, disseminated focal disease such as meningitis, abscesses, osteomyelitis, and long-term carriage of the infection strain. Other hospitalized patients at greater risk for salmonellosis are the aged and debilitated. Patients with malignancy more commonly experience bacteremic salmonellosis than other groups.

Prior administration of an antimicrobial agent is a well-established predisposing event in the occurrence of intestinal salmonellosis.⁵ In the study reported in this issue, 91% of the culture-proven cases occurring in children had received an antibiotic in the past month, compared with a rate of 23% to 35% for the other subjects with nosocomial diarrhea. The important effect of the antibiotic appears to be reduction of

intestinal flora and the associated organic acids normally produced by floral fermentation of dietary carbohydrates. The facilitation of intestinal colonization of *Salmonella* by concomitant administration of antimicrobials compounds the problem of indication for therapy of the disease. Asymptomatic *Salmonella* intestinal infection and mild cases of disease probably should not be treated with antimicrobials, which tend to promote prolonged organism carriage. However, because bacteremia complicates intestinal salmonellosis in just under 10% and dissemination occurs in newborns and in the immunosuppressed, antimicrobials should be given to the more severely ill or more debilitated patients with *Salmonella* infection. The antimicrobial agents should be given in these cases for more than two weeks, and follow-up cultures should be obtained up to 21 days after therapy.⁶

One of the unexplained observations is the relative rarity of nosocomial shigellosis. All humans are susceptible to *Shigella* in low concentrations, with healthy adults developing shigellosis following ingestion of 100 viable organisms.⁷ While *Shigella* species are potentially the most communicable of bacterial pathogens, in the National Nosocomial Infection Study, shigellosis was reported in only one of the 3,363 patients diagnosed with nosocomial enteric infection identified during 1986-1989. The Nairobi study, while documenting the presence of *Shigella* in newly hospitalized patients, failed to provide convincing evidence for important nosocomial spread of the organisms.

In controlling the spread of enteric pathogens, attention must be paid to decreasing the chance of cross infection. Effective handwashing must be practiced by hospital personnel while caring for patients with diarrhea and while working in newborn nurseries or with debilitated patients. Infected personnel should be relieved of patient contact or food preparation/serving while infected until fecal cultures become negative. Prompt outbreak investigation should be initiated when two or more cases of diarrhea occur, and during outbreaks, it is advisable to isolate infected patients in separate rooms. Enteric precautions should be employed in these areas. In nurseries where enteric isolation is not possible, a cohort system should be instituted during outbreaks. Infected patients should be discharged from the hospital when feasible.

REFERENCES

1. Paton S, Nicolle L, Mwangera M, et al. *Salmonella* and *Shigella* gastroenteritis at a public teaching hospital in Nairobi. *Infect Control Hosp Epidemiol.* 1991;12:710-717.
2. DuPont HL, Ribner BS. Infectious gastroenteritis. In: Bennett JV, Brachman PS, eds. *Hospital Infections*. 3rd ed. Boston, Mass: Little, Brown, and Co.; in press.
3. Riley LW, Ceballos O, Trabulsi LR, et al. The significance of hospitals as reservoirs for epidemic multiresistant *Salmonella*

- typhimurium* causing infection in urban Brazilian children. *J Infect Dis.* 1984;150:236-241.
4. Hadfield TL, Monson MH, Wachsmuth IK. An outbreak of antibiotic-resistant *Salmonella* enteritidis in Liberia West Africa. *J Infect Dis.* 1985;151:790-794.
 5. Pavia AT, Shipman LD, Wells JG, et al. Epidemiologic evidence that prior antimicrobial exposure decreases resistance to infection by antimicrobial-sensitive *Salmonella*. *J Infect Dis.* 1990;161:255-260.
 6. Neill MA, Opal SM, Heelan J, et al. Failure of ciprofloxacin to eradicate convalescent fecal excretion after acute salmonellosis: experience during an outbreak in health care workers. *Ann Intern Med.* 1991;114:195-199.
 7. DuPont HL, Levine MM, Homick RB, Formal SB. Inoculum size in shigellosis and implications for expected mode of transmission. *J Infect Dis.* 1989;159:1126-1128.