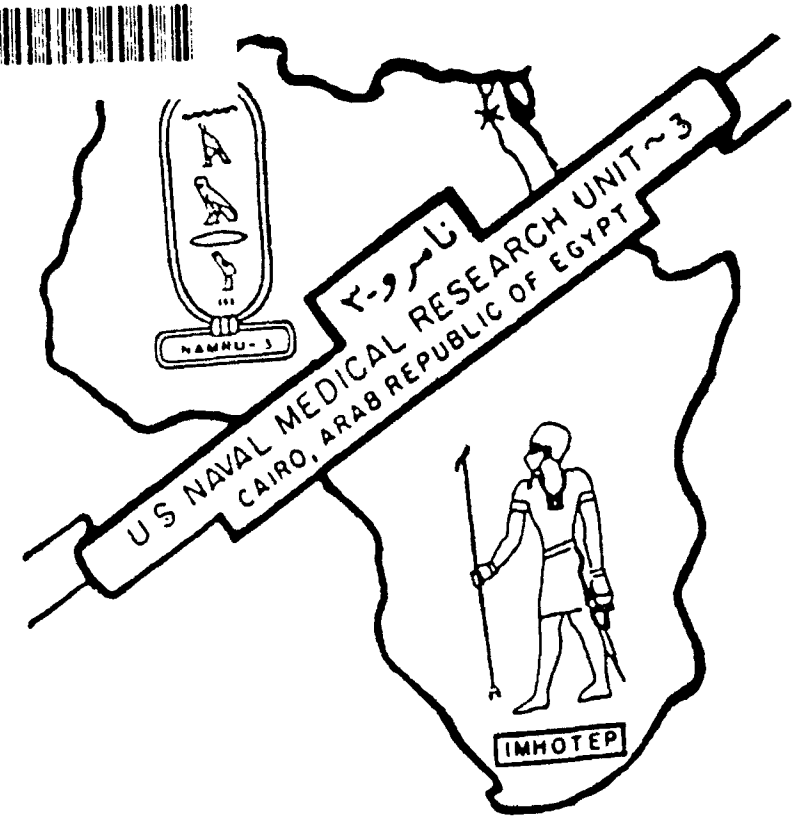

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MULTIPLE-DRUG-RESISTANT SALMONELLA TYPHI

BY

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Multiple-Drug-Resistant *Salmonella typhi*

SIR—From May 1991 through January 1992, 35 of 192 individuals presenting to Alexandria Fever Hospital, Alexandria, Egypt, who had signs and symptoms consistent with the clinical diagnosis of enteric fever were studied. Cultures of blood, stool, or both specimens from all 35 patients yielded *Salmonella typhi*. Fifteen (43%) of the isolates were resistant to chloramphenicol, ampicillin, and trimethoprim-sulfamethoxazole (TMP-SMZ) and were sensitive to norfloxacin, ciprofloxacin, and ceftriaxone (Bauer-Kirby method) [1]. Five of the 15 patients whose samples yielded multiresistant *S. typhi* isolates were treated with ofloxacin (200 mg every 12 hours for 10 days); these patients recovered and did not relapse. The first eight multiresistant *S. typhi* isolates and the two sensitive isolates were analyzed for Vi-phage type and plasmids. Drug-resistant isolates were of Vi-phage types E2 (seven) or D1-N (one), and resistances were encoded by a 120-MD plasmid of the H1 incompatibility group. For these isolates, the mean MIC of chloramphenicol was >90 μg/mL; that of ampicillin was >15 μg/mL; and that of TMP-SMZ was >50 μg/mL. Drug-sensitive *S. typhi* isolates were of Vi-phage types 57 and C1 and lacked the 120-MD plasmid.

All patients (eight males, seven females; mean age, 11.4 years) reported taking antibiotics before presentation, and the mean durations of illness before presentation were 13.8 days and 9.1 days, respectively, for patients with infection due to multiresistant or antibiotic-sensitive *S. typhi*. Although all patients from whom resistant *S. typhi* organisms were isolated were residents of the Alexandria area, the cases were not clustered in a specific area of the city.

Further testing of the multiresistant isolates revealed that all were positive for β-lactamase when the nitrocefin test was performed, and they were also positive for chloramphenicol acetyltransferase.

Rowe et al. [2] have reported the isolation of chloramphenicol- ampicillin-, and trimethoprim-resistant *S. typhi* in the United Kingdom during 1986–1991, with a marked increase in frequency of isolation of these organisms since 1990. Most of the isolates recovered by these authors were from individuals who had acquired infection in Pakistan or India, and the phage types involved were M1 (Pakistan) and E1 (India). Additional reports of *S. typhi* organisms with similar drug-resistance patterns have come from Pakistan [3], India [4], and Bahrain [5]. In the majority of multiresistant strains, the resistances have been encoded by a single plasmid of the incompatibility group-H complex, usually H1 [6–8].

Until 1988, Egypt was remarkably free of drug-resistant *S. typhi*; occasional chloramphenicol-resistant strains were isolated [9, 10], but these did not become established. In 1988 there was a report of a single isolate of *S. typhi* that was resistant to chloramphenicol, ampicillin, and TMP-SMZ [9]. Our results suggest that *S. typhi* with this phenotype has become established and that in some settings in this country, it is the causative agent of a significant fraction of cases of enteric fever seen in the hospitals. However, it is significant that the strains isolated in Egypt belong to phage types E1 and D1-N, in that it would appear that these strains are not an extension of the current epidemic in the Indian subcontinent.

These findings and those of other investigators [3–5] support the proposition that *S. typhi* strains resistant to all of the first-line antibiotics used in treatment of typhoid fever are endemic in the Indian subcontinent, the Arabian Gulf, and now, in northeastern Africa. Because such strains are increasingly being isolated over a wide geographic area, consideration should now be given to treating infections acquired in the Indian subcontinent, Arabian Gulf, and northeastern Africa with agents other than chloramphenicol, ampicillin, or TMP-SMZ.

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