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The Inguinal Skin: An Important Site of Colonization with Extended-Spectrum β-Lactamase–Producing Enterobacteriaceae

Extended-spectrum β-lactamase (ESBL)–producing Enterobacteriaceae are spreading and becoming more prevalent worldwide.[1-3] Once colonized, carriers of ESBL-producing Enterobacteriaceae carry the strain for prolonged periods and may serve as an important source for the spread of ESBL-producing strains. Unlike for carriers of methicillin-resistant *Staphylococcus aureus* (MRSA),[4] for carriers of ESBL-producing Enterobacteriaceae there is no established decolonization regimen available. Screening for ESBL-producing Enterobacteriaceae has been performed by using rectal and urine sampling, coupled with throat or wound sampling if clinically indicated.[5,6] To our knowledge, skin colonization with ESBL-producing Enterobacteriaceae has never been extensively studied, because exclusive carriage of ESBL-producing Enterobacteriaceae on the skin is considered unlikely. The aim of this study was to determine the rate of inguinal colonization in carriers of ESBL-producing Enterobacteriaceae.

The study was performed at the Cantonal Hospital of Aarau, Switzerland, a primary and tertiary care center with 2 intensive care units and 24,000 patients admitted per year. During the period from November 2006 through April 2009, all newly detected carriers of ESBL-producing Enterobacteriaceae gave perianal swab samples, bilateral inguinal swab samples, and a urine sample for screening, as required by infection control.

Infection or colonization with ESBL-producing Enterobacteriaceae was diagnosed mainly by means of clinical culture sampling. Six patients were screened for ESBL-producing Enterobacteriaceae during a limited outbreak of ESBL-producing *Klebsiella pneumoniae* in the intensive care unit that involved 14 individuals. The guidelines of the Clinical and Laboratory Standards Institute were used for microbiological detection of ESBL production. From November 2006 through June 2008, routine susceptibility testing was performed with microbroth dilution (Micronaut-S; Merlin), and the following antibiotics were used for screening: cefpodoxime, ceftriaxone, and ceftazidime. Since July 2008, a chromogenic medium (chromID ESBL; bioMérieux) has been used for rapid identification of ESBL production. If the screening test yielded positive results, confirmation testing was performed with Etest strips containing cefotaxime or ceftazidime, each tested with and without clavulanic acid.

During the study period, 75 carriers of ESBL-producing Enterobacteriaceae with a median age of 62 years (range, 18–88 years) were identified. Thirty-seven (49%) patients were men, and 57 (76%) patients were hospitalized at the time of diagnosis as ESBL carriers; 21 (37%) of the 57 hospitalized patients were in the intensive care unit. *Escherichia coli* (43 [54%] of 79 strains) and *K. pneumoniae* (34 [43%] of 79 strains) were the most common ESBL-producing organisms, and 4 patients were colonized with 2 different strains of ESBL-producing Enterobacteriaceae. Results from screening of inguinal, perianal, and urine samples were available for 57 (76%), 60 (80%), and 65 (87%) of the 75 colonized individuals, respectively. Inguinal colonization was found in 36 (63%) of 57 patients, perianal colonization in 42 (70%) of 60 patients, and urine colonization in 47 (72%) of 65 patients. Inguinal colonization was significantly more common in hospitalized patients than in outpatients (73% vs 27%; odds ratio, 7.33 [95% confidence interval, 1.41–42.72]; $P = .01$). In 1 patient only the inguina were colonized. Results from screening of perianal and urine samples showed only limited correlation with results from screening of inguinal samples (Table 1).

Our findings indicate that the skin is an important site of colonization in patients infected or colonized with ESBL-producing Enterobacteriaceae. Clinical trials are ongoing in

TABLE 1. Results from Screening Perianal, Inguinal, and Urine Samples for Extended-Spectrum β-Lactamase (ESBL)–Producing Enterobacteriaceae

Site and colonization status	No. (%) of patients
Perianal, positive (n = 60)	42 (70)
Inguinal, positive (n = 57)	36 (63)
Urine, positive (n = 65)	47 (72)
Inguinal, positive; perianal, negative (n = 56)	7 (12)
Inguinal, positive; urine, negative (n = 51)	10 (20)
Inguinal, negative; urine, positive (n = 51)	13 (25)

an attempt to decolonize carriers of ESBL-producing Enterobacteriaceae. However, treatment of the skin is not part of such studies (S. Harbath, written communication, 2009). Previously attempted decolonization methods, including gut and urinary decontamination with systemic antibiotics, have been of limited efficacy.[7,8] Results could probably be improved if skin decolonization were included in the decolonization regimens. As with MRSA colonization, failure to identify an important site of colonization could result in decolonization failure. In a recent study, a new decolonization regimen including antibiotics and application of topical antimicrobial agents for throat carriage showed promising results in a subgroup of patients.[5] On the basis of our findings, future decolonization attempts should also include treatment of skin colonization with antiseptic soaps. In summary, skin colonization was common in carriers of ESBL-producing Enterobacteriaceae and may be important for nosocomial transmission of these pathogens.

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