DETECTION OF EXTENDED-SPECTRUM β-LACTAMASE PRODUCING ENTEROBACTERIACEAE BY CHROMOGENIC ESBL SELECTIVE MEDIUM

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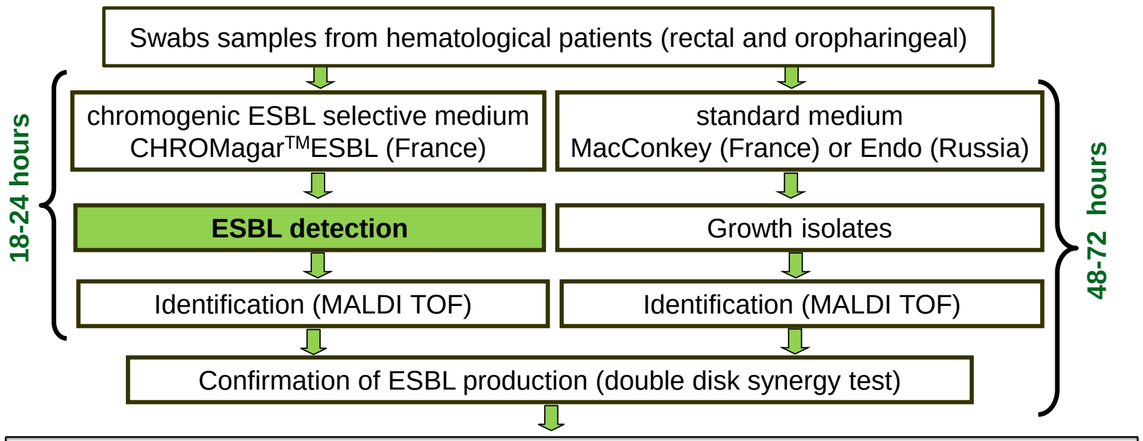
OBJECTIVES

The aim of the study was to evaluate the detection of extended-spectrum beta-lactamase producing *Enterobacteriaceae* (ESBL-E) by chromogenic ESBL selective medium and to compare results with double disk synergy test.

METHOD

Prospective study was performed from April 2013 to December 2013.
Study design was as follows:



Additional tests

- AmpC detection

Strains sensitive to Cefepime and resistant to Cefoxitin → E-test (Cefotetan and Cefotetan with Cloxacillin)

- Detection of TEM-1 and CTX-M by real-time PCR

RESULTS

We collected 1552 swabs and 1243 *Enterobacteriaceae* isolates were obtained. A total of 394 ESBL-E strains were recovered (Fig. 2), of those 123 (31%) only on chromogenic ESBL selective medium, 263 (67%) on standard medium and on CHROMagar™ESBL, 8 (2%) only on standard medium ($p < 0,0001$, Fig. 1). Characteristics of ESBL-E are summarized in Table 1. CTX-M group of ESBL were detected in the majority of ESBL-E.
Production of ESBL was confirmed for 94% (386/409) isolates obtained on chromogenic ESBL selective, other 6% (23/409) isolates were non-ESBL-E (Tab. 2). Sensitivity and specificity of CHROMagar™ESBL was 98% and 97%, respectively (Tab. 3).

CONCLUSION

Chromogenic ESBL selective medium had high sensitivity (98%) and specificity (97%) for the detection of ESBL-E and might be used in routine laboratory practice. Detection of ESBL-E from the same rectal swabs by chromogenic ESBL selective medium was significantly higher than by standard medium (98% vs. 69%, $p < 0,0001$) and data were reported to clinical department in 18-24 hours.

RESULTS

Fig. 1. ESBL-E detection

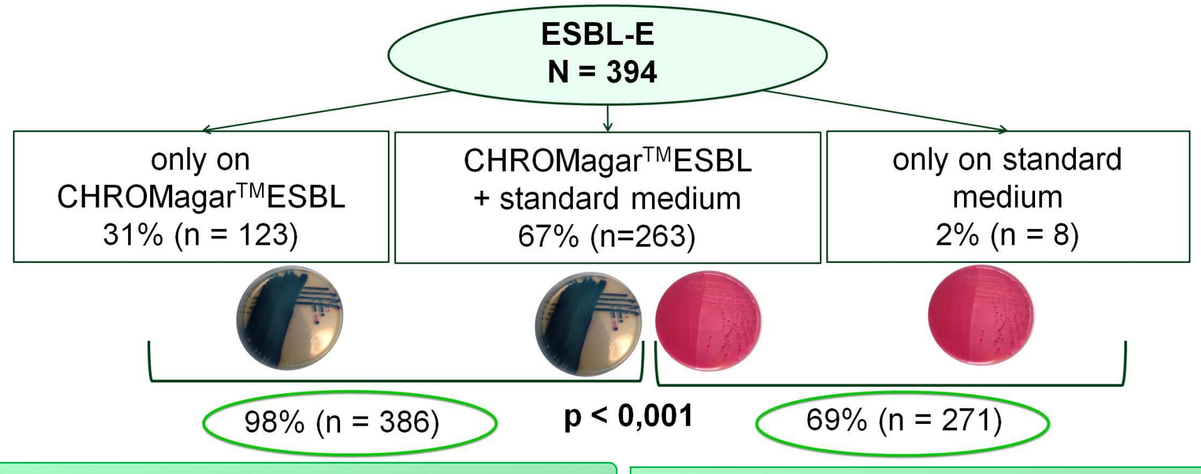


Fig. 2. Distribution of ESBL-E (N = 394)

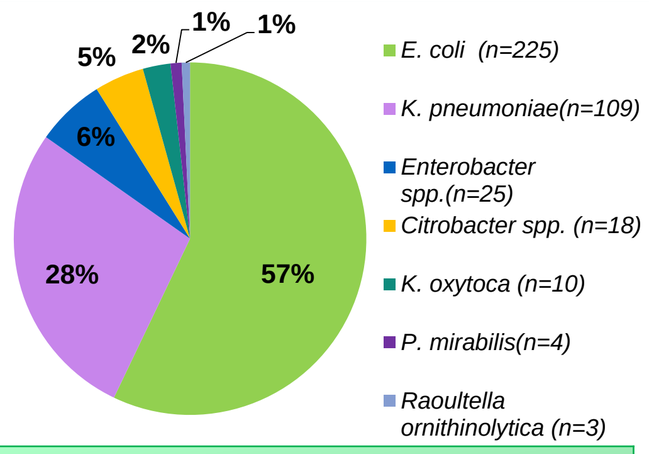


Table 1. Characteristics of ESBL-E

ESBL-E	CTX-M, n (%)	TEM, n (%)	TEM+ CTX-M, n (%)
E. coli	157 (70)	107 (48)	64 (28)
K. pneumoniae	51 (47)	36 (33)	10 (9)
Enterobacter spp.	20 (80)	10 (40)	7 (28)
Citrobacter spp.	14 (78)	8 (44)	7 (39)
K. oxytoca	7 (70)	3 (30)	2 (20)
P. mirabilis	1 (25)	4 (100)	1 (25)
Raoultella ornithinolytica	2 (67)	1 (33)	1 (33)
Total	**252 (64)**	**169 (43)**	**92 (23)**

Table 2. False positive detection of ESBL on CHROMagar™ESBL (n=23)

Strains (N)	Species	n (%)
ampC (+) strains (N=15)	*Enterobacter* spp.	11 (73)
	Citrobacter spp.	2 (13)
	M. morganii	1 (7)
	E. coli	1 (7)
Strains sensitive to cephalosporins (N=8)	*E. coli*	3 (37,5)
	K. oxytoca	2 (25)
	P. vulgaris	2 (25)
	Citrobacter spp.	1 (12,5)

Table 3. Sensitivity and specificity of CHROMagar™ESBL medium

Species of ESBL-E	Sensitivity	Specificity
E. coli	99%	99%
K. pneumoniae	96%	100%
Other *Enterobacteriaceae*	98%	95%
Total	98%	97%

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