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Decontamination of 3rd-generation cephalosporin- and carbapenem-resistant Gram-negative bacteria in ICU patients

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Background: The prevalence of carriage and infections with extended spectrum beta lactamase and carbapenemase producing Enterobacteriaceae is rising, in particular in ICU. Decontamination strategies of the oropharynx and gut may reduce risks of infection and cross transmission, although evidence is conflicting.

We hypothesised that Selective Digestive Decontamination (SDD), Selective Oropharyngeal Decontamination (SOD) and chlorhexidine [1% or 2%] mouthwash (CHX) eradicates carriage with 3rd-generation cephalosporin resistant Enterobacteriaceae (3GCE) and carbapenem resistant gram-negative bacteria (CR-GNB) in the oropharynx and rectum.

Material/methods: We analysed data from 6 of 13 European ICUs participating in an ongoing cluster randomised cross-over trial comparing SDD, SOD and CHX to a baseline period of standard care (SC). SDD consisted of a mouthpaste and gastro-enteral suspension with colistin, tobramycin and nystatin. SOD consisted of the mouthpaste only. Rectum and respiratory tract samples (endotracheal aspirate or throat swab) were obtained twice weekly and for clinical reasons and plated on selective media (chrom-ID[®], bioMérieux). For the clinical study we enrolled patients expected to be ventilated for at least 24 hours. For the current analysis we included patients in which CR-GNB or 3GCE were identified in rectum or respiratory tract samples during ICU-stay. Decontamination was defined as the absence of 3GCE or CR-GNB in subsequent samples, until ICU discharge.

Results: Among the 2.681 patients enrolled in the clinical study, 3GCE or CR-GNB were detected in rectum samples of 620 (27,8%) and 248 patients (11,1%), respectively, and in respiratory tract samples of 306 (11,7%) and 220 patients (8,4%), respectively. Compared to SC, incidence rate ratios (IRR) of decontamination of the rectum were 2,67 (95% confidence interval (CI), 1,80-3,99) for 3GCE

and 2,49 (95% CI, 1,40-4,41) for CR-GNB during SDD. IRRs were not statistically significantly different from SC for CHX and SOD (Table).

In respiratory tract samples, IRRs for decontamination, compared to SC, for 3GCE were 2,00 (95% CI, 1,27-3,13) and 1,83 (95% CI, 1,16-2,87) for SOD and SDD, respectively. IRRs for CR-GNB were not statistically significantly different from SC for SDD, SOD and CHX.

Conclusions: SDD, but not SOD and CHX, was associated with successful decontamination of rectal carriage of 3GCE and CR-GNB. SDD and SOD, but not CHX, were associated with decontamination of 3GCE from the respiratory tract. None of the decontamination regimens were associated with decontamination of CR-GNB from the respiratory tract.

Table

	baseline	CHX		SOD	
	IRR*	IRR*	95% CI	IRR*	95% CI
3rd-generation cephalosporin resistant Enterobacteriaceae					
rectum	1,00	0,99	(0,66-1,49)	1,27	(0,84-1,92)
respiratory	1,00	1,09	(0,71-1,65)	2,00	(1,27-3,13)
carbapenem resistant GNB					
rectum	1,00	1,14	(0,65-1,99)	0,77	(0,40-1,43)
respiratory	1,00	0,96	(0,52-1,73)	0,94	(0,50-1,73)

* incidence rate ratio per 1000 days at risk, compared to baseline