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More and more third generation cephalosporin-resistent enteric bacteria everywhere?

Prevalence, risk factors for carriage and molecular features of ESBL-producing Enterobacteriaceae: a national survey of Israeli cattle, 2013

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Objectives: There are very few data regarding the risk factors for carriage and the transmission of ESBL-producing Enterobacteriaceae (ESBLPE) in farm animals. Our objectives were to study the prevalence, risk factors for carriage and transmission dynamics of ESBLPE in a national survey of cattle.

Methods: This was a point-prevalence study conducted from July to October 2013 in Israel. Stool samples from individual cows were collected from cowsheds of all breed types. The following data were collected (at the section level): age, animal well-being scores, infrastructure characteristics and veterinary treatment. Stool was inoculated onto CHROMAgar ESBL™ plates. ESBL production was tested by the combined disk method and antimicrobial susceptibility testing was done by the disk diffusion method. Molecular typing was done by REP-PCR and presence of bla_{ESBL} genes was determined by PCR. Analyses were done at the section level; in most cases, 10 cows were sampled per section. Bivariate and multivariate analyses were conducted using mixed-effects Poisson regression; results were expressed as rate ratios (RR).

Results: The study included 1226 cows in 123 sections on 40 farms. ESBLPE were identified in 291 samples (23.7%): 287 *E. coli* and 4 *K. pneumoniae*. The number of ESBLPE-positive cows was highest in quarantine stations of imported calves (mean=4.3 positive cows per section, reference group) and fattening farms (mean=2.5, RR=0.58) and was lowest in pasture farms (mean=0.4, RR=0.07; p=0.03). The number of ESBLPE-positive cows was lowest in sections containing the adult cows (>25 months) (mean=0.9, reference group) and highest in the calves (<4 months) (mean=5.3, RR=6.53; p<0.001). Infrastructure variables that were significant risk factors for ESBLPE carriage included crowding, lack of manure cleaning and lack of a cooling system (p<0.001 for each). Crowding and lack of manure cleaning were more common in sections containing the calves. Antimicrobial prophylaxis, usually a tetracycline derivate, was given almost exclusively to the calves and was associated with a high number of ESBLPE carriers (a mean of 5.2 vs.1.3 in sections with and without prophylaxis, respectively; RR=0.23 for non-treated, p<0.001). The 287 *E. coli* isolates were typed into 106 REP-PCR types, harboring mostly $bla_{CTX\text{-}M\text{-}1}$ (n=233, 80%) or $bla_{CTX\text{-}M\text{-}9}$ group (n=28, 9.6%) genes. Most REP-PCR types (n=232, 80%) were identified in ≥2 isolates. The three most common REP-PCR types were identified in 20 isolates (8 sections, 3 farms), 13 isolates (5 sections, 2 farms) and 11 isolates (3 sections in 3 farms). Fourteen REP-PCR types were identified in more than 1 farm, with only 6 of the farms adjacent to each other.

Conclusions: The prevalence of ESBLPE carriage is high in calves in cowsheds where the use of antimicrobial prophylaxis, lack of cleaning and crowding are common. ESBLPE disseminate within cowsheds mainly by clonal spread, with limited inter-cowshed transmission.