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ARE METALS DRIVING THE EMERGENCE OF SALMONELLA NON-TYPHOID MULTIDRUG RESISTANT CLONES?

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Antibiotic resistant (ABR) Salmonella is a public health threat and might be selected by diverse environmental stressors (e.g. metals) used in animal production setting. We aimed to assess occurrence of known metalR genes among non–typhoid Salmonella belonging to clinical relevant clonal lineages and to characterize the genetic elements linked to their mobilization along with ABR genes.

Salmonella (n=92) of 16 serotypes, including emergent S. 4,[5],12:i:- (n=32) and S. Rissen (n=30), and 30 isolates representative of ABR clones from human/non–human sources from Portugal (2000–2011) were studied. Genes associated with ABR/integrons (Int), CuR (pcOD), AgR (silA), HgR (merA), AsR (arsB) or TeR (terF) were searched by PCR/sequencing. Conjugation assays, genomic location (I–CeU/S1–PFGE/hybridization) and plasmid (PL) analysis (rep–PCR/sequencing) were done.

AgR(72%), CuR(57%), HgR(47%). TeR (3%) or AsR(1%) genes were found in different serotypes. All S. Rissen (ST469: 60%–blaTEM–aadA–sul1/sul3–tetA–dfrA12) carried pcOD+silA in chromosome (Ch) as S. Typhimurium monophasic variant from European clone (n=17; ST34), which also have co–located ABR genes (blaTEM–strA–strB–sul2–tetB) and the majority merA. In contrast, S. Typhimurium monophasic variant of the Spanish (n=10: ST19) and Portuguese (n=5: ST19) MDR clone carried merA and/or silA on large non–transferable IncA/C PL (110–170 Kb) or IncR PL (110–140) respectively and MDR S. Typhimurium (n=11: 4 clones: ST19/ST313) the silA (n=1: DT104 clone) on IncN PL (135Kb) with atypical type I–sul3 integron, and merA (n=3) with int1–oxa30–aadA1 (n=2) or aadA1 (n=1) on transferable IncFII PL (140Kb). In S. Enteritidis (ST11) only merA (n=2/4) was detected on transferable IncP PL (80Kb) along with int1–dfrA1–aadA1. In isolates of other MDR clones (n=15: 12 serotypes), merA (n=13) and/or silA+pcOD (n=6) were co–located with different Int on large plasmids (>100Kb: IncHI1/IncP/IncI1/NT). The arsB (n=1) and/or terF (n=3) were located on transferable IncHI2 (240Kb) with blaCTX–M–9 and in IncP (265Kb) and untypeable (250Kb) PL, with int1–aadA1 or dfrA1–aadA1/pcoD/silA/merA.

MetalR genes were often co–located with Int/ABR genes in diverse PL types carried by clinically relevant serotypes/clones, demonstrating the high genome plasticity of Salmonella to acquire different adaptive traits. Continued use of Cu/Ag or Hg environmental pollution might favour the selection of ABR Salmonella by clonal spread and/or PL horizontal transfer.