Apramycin treatment affects selection and spread of a multidrug-resistant Escherichia coli strain able to colonize the human gut in the intestinal microbiota of pigs

The effect of apramycin treatment on transfer and selection of an Escherichia coli strain (E. coli 912) in the intestine of pigs was analyzed through an in vivo experiment. The strain was sequenced and assigned to the sequence type ST101 and serotype O11. It carried resistance genes to apramycin/gentamicin, sulphonamide, tetracycline, hygromycin B, β-lactams and streptomycin [aac(3)-IV, sul2, tet(X), aph(4), bla TEM-1 and strA/B], with all but tet(X) located on the same conjugative plasmid. Nineteen pigs were randomly allocated into two inoculation groups, one treated with apramycin (pen 2) and one non-treated (pen 3), along with a non-inoculated control group (pen 1). Two pigs of pen 2 and 3 were inoculated intragastrically with a rifampicin resistant variant of the strain. Apramycin treatment in pen 2 was initiated immediately after inoculation. Strain colonization was assessed in the feces from all pigs. E. coli 912 was shown to spread to non-inoculated pigs in both groups. The selective effect did not persist beyond 3 days post-treatment, and the strain was not detected from this time point in pen 2. We demonstrated that E. coli 912 was able to spread between pigs in the same pen irrespective of treatment, and apramycin treatment resulted in significantly higher counts compared to the non-treated group. This represents the first demonstration of how antimicrobial treatment affects spread of resistant bacteria in pig production. The use of apramycin may lead to enhanced spread of gentamicin-resistant E. coli. Since gentamicin is a first-choice drug for human bacteremia, this is of concern.

General information
State: Published
Organisations: National Food Institute, Research Group for Genomic Epidemiology, University of Copenhagen
Contributors: Herrero-Fresno, A., Zachariasen, C., Hansen, M. H., Hendriksen, R. S., Nielsen, S. S., Olsen, J. E.
Number of pages: 10
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Veterinary Research
Volume: 47
Issue number: 1
Article number: 12
ISSN (Print): 0928-4249
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): SJR 1.266 SNIP 1.139
Web of Science (2017): Impact factor 2.903
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): SJR 1.44 SNIP 1.303
Web of Science (2016): Impact factor 2.798
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.66 SJR 1.537 SNIP 1.153
Web of Science (2015): Impact factor 2.928
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.46 SJR 1.453 SNIP 1.423
Web of Science (2014): Impact factor 2.815
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 3.13 SJR 1.681 SNIP 1.701
Web of Science (2013): Impact factor 3.383
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2