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Mobilome and resistome analysis of canine multidrug resistant methicillin-resistant *Staphylococcus sciuri* strain C2865 and comparative genomics of *S. sciuri* species group

Statement of the Problem: Antibiotic resistance is one of the biggest threats to global health, food security, and development today. *Staphylococci* are common member of our skin and mucosa, but they are also a common cause of severe infections and resistance to first line antimicrobial to treat their infections is widespread. Here, a multidrug- and methicillin-resistant *Staphylococcus sciuri* strain C2865 (canine nasal sample, Nigeria) showed trimethoprim resistance for which all staphylococcal *dfr* genes were negative. This strain was subjected to whole-genome-sequencing (WGS) for resistome and mobilome profiling and to comparative genomics with all NCBI-deposited *S. sciuri* species group genomes for diversity analysis.

Methodology & Theoretical Orientation: Illumina Miseq was used for C2865 WGS and in-house pipelines (SPAdes, Prodigal, tRNAscan-SE, RNAmmer, NCBI NR, COG, TIGRfam, RAST, ISsaga2) were followed for data processing and analysis. Plasmid contigs identification and plasmids reconstruction were achieved by contig coverage, sequence similarity and composition. PCR plus sequencing was done for scaffolding regions of interest. Average Nucleotide Identity (ANI) between all 22 available *S. sciuri* group strains and comparative and pangenome analysis of *S. sciuri* group strains was calculated using J Species progressive mauve, clonal frame and roary, respectively.

Findings: *S. sciuri* C2865 revealed 2,937,715 bp in size, a GC content of 32.7%, and 3316 CDSs, with 1887 genes categorized into COG functional groups. Two small resistance plasmids and two novel mobilizable plasmids were reconstructed. p2865-3, a multidrug resistance plasmid, revealed a trimethoprim resistance gene described for the first time in marine *Exiguobacterium* (order *Bacillales*). p2865-4 carried the intercellular adhesion gene cluster involved in biofilm formation. A novel staphylococcal cassette chromosome (SCCmec) was identified. Additional chromosomal resistance genes (antibiotic, metal, biocide) and mobile genetic elements (MGEs) were detected. C2865 shared highest ID with *S. sciuri* Z8 and SNUDS-18 (99-98%), comprising a different branch within the species. WG alignment among all *S. sciuri* genomes revealed a core genome of 1.7 Mb (60.7%). Synteny was preserved among these genomes while there were several genomic islands with distinct gene content.

Conclusion & Significance: Several novel MGEs are detected revealing, among others, a novel *dfr* gene conferring thrimethoprim resistance not only in *S. sciuri* but also in an environmental species. 2) WGS reveals a trustful tool to identify and characterize novel and already known resistance & virulence determinants and MGEs. 3) Comparative genomics shows high *S. sciuri* intraspecies diversity and high genome plasticity. 4) Commensal *staphylococci* represent a reservoir for mobilizable AMR & virulence determinants.

Biography

Elena Gómez-Sanz is an expert on staphylococcal antimicrobial resistance and currently focusses her research is on animal and environmental antimicrobial resistance from a one health perspective following next-generation approaches. She has participated in six national and international projects, and is currently Principal Investigator for the Swiss National Science Foundation NFP72 ("Antimicrobial Resistance"). She has developed her research career in Spain, UK, Germany, Australia and Switzerland, and has been awarded a number of grants and fellowships in competitive, merit-based calls from national and international organizations. She has participated in more than 40 scientific publications and contributed with 75 presentations in international and national conferences. She participates as reviewer for several scientific editorials and is Member of several scientific societies. Since December 2016, she is a Postdoctoral Fellow at the Swiss Federal Institute of Technology Zurich (ETHZ).

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