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Prevention of antibioresistance transfer in environmental bacteria using appropriate decontamination methods in the lab

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With the generalization of DNA-recombinant technologies in research and production laboratories, one of the biosafety goals is the prevention of the accidental release of genetically modified microorganisms (GMOs) in the environment. Routine laboratory work includes the daily use of non-pathogenic *E coli* strains transformed with a variety of plasmids expressing at least one antibiotic resistance gene (ABR) used as a selecting tool of successfully transformed bacteria. To prevent their accidental release in the environment, different disinfection / decontamination methods are used to neutralized those GM bacteria at the end of their use.

In order to check the efficacy of those methods, we collected samples of waste water from two research institutes, from laboratory sink exhaust ducts, as well as from treatment tanks of waste water treatment plants. Isolates were identified using the 16s ribosomal RNA sequencing and they were tested for the presence of two replication origins and seven ABR frequently found in laboratory plasmids. Only one isolate (out of 64) was an *E. coli*, indicating that laboratory staff applied correct neutralization methods.

Surprisingly, in the vicinity of research institute mostly, plasmid origin of replication typical of Enterobacteriaceae was found in non-Enterobacteriaceae bacterial strains (such as Pseudomonas sp. And Aeromonas sp.) Suggesting an interspecies transfer of plasmids. This raised a question about the efficacy of disinfection / decontamination methods to breakdown DNA (DNase effect). Indeed, sodium hypochlorite (largely used in research laboratories) has only a limited DNase effect compared to acids and quaternary amine compounds (QACs), or moist heating / UV treatments. Using quantitative Polymerase Chain Reaction (qPCR), we determined the Decidual value (D) of several (chemical and physical) neutralization methods for their DNAse effect. This work led to recommendations for the treatment of liquid laboratory wastes aimed at reducing the risk of accidental release of intact ABR plasmids in the environment.

Biography

Suzanne M Loret acquired her expertise in biological risk assessment / management, thanks to a 20-year career as a scientist in a cell and molecular biology laboratory. Besides a solid background in this field, she is deeply involved in continuous learning of biosafety - and related topics - through regular participation in conferences and seminars organized by the European Biosafety Association (EBSA) as a 'learner'. She is also regularly an 'instructor' of biosafety training, being member the working group on education and training (ETWG) of EBSA since 2018. Moreover, biosafety teaching is part of her daily profession as institutional head of biosafety at the University of Namur (Belgium).