Dynamics of conjugation in the Bacillus subtilis plasmid pLS20

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Bacterial conjugation is one of the horizontal gene transfer processes in which a donor bacterium transfers its conjugative plasmid to a recipient bacterium to become, for example, resistant to an antibiotic. Several experimental studies carried out in recent years have shown that three proteins are involved in the regulation of the conjugation genes present in the pLS20 conjugative plasmid of Bacillus subtilis. In this case, the main promoter that enables conjugation is repressed by a regulatory protein, called RcopLS20, that induces the formation of a DNA loop. However, an anti-repressor of RcopLS20, which enables activation of the conjugation promoter, called RappLS20, is inactivated by a plasmid-encoded signaling peptide, Phr*pLS20. This peptide needs to be exported out of the cell to be modified into its active form and is therefore a quorum-sensing signal that allow cells to receive information from their environment. With the aim of deepen the understanding of this system, this work proposes a mathematical model, using a system of differential equations, which describes the dynamics between the concentration of the conjugative gene and the proteins involved during the conjugation process, contrasted with experimental data.

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