How ribonucleases control characteristic traits of Pseudomonas putida lifestyle

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Ribonucleases (RNases) are important effectors on post-transcriptional regulation and coordinators of bacterial adaptation to stress. The aim of this work is to shed light on the importance of ribonucleases function for the versatile metabolism of Pseudomonas putida. This gram-negative saprophytic bacterium is generally recognized as a laboratory work-model of environmental bacteria and is endowed with a diversity of metabolic and stress-endurance traits that make it an ideal chassis for biotechnological needs.
Bacterial RNases have been most extensively studied in the model organism Escherichia coli, however, in P. putida that information is still scarce. Following this line, we have constructed mutants for five different P. putida ribonucleases, two exoribonucleases (PNPase and RNase R) and three endoribonucleases (RNase E, RNase III and RNase G). We globally analyse the physiological and metabolic costs of the absence of each of these enzymes. The impact of these mutants is also tested in terms of growth, motility and morphology, as well as the effects of different oxidative chemicals that could act as a proxy of the stressors present on the natural environment of this microorganism. We conclude that each ribonuclease seems to be specifically related with different traits of the metabolism of this microorganism. Moreover, the physiological response of P. putida in the absence of each enzyme differs, in some cases, from the one previously observed in E. coli revealing evident differences in the metabolism of these two bacteria but also different enzymatic functions of the ribonucleases in each bacterial landscape.