The conserved endoribonuclease RNase III affects formation of photosynthetic complexes in Rhodobacter sphaeroides

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Bacteria are frequently adjusting their transcriptome to adapt to changes in their environment. This does not only take place on level of transcription, but also involves ribonucleases (RNases) that control RNA processing and turn-over. RNase III (*rnc*) is a highly conserved endoribonuclease, which is present in all known eukaryotes (Dicer and Drosha are RNase III enzymes) and prokaryotes, and was shown to be an important regulator of gene expression in many organisms. The enzyme can contain one or two nucleolytic active RNase III domains (RIIID) that harbour a 9 amino acids RNase III signature motif. Bacterial RNase III enzyme typically contain a single RIIID, often followed by a C-terminal dsRNA binding domain.

Rhodobacter sphaeroides is a facultative phototrophic alpha proteobacterium that can perform aerobic respiration in presence of oxygen, as well as anoxygenic photosynthesis, anaerobic respiration or fermentation in absence of oxygen. To better understand the role of RNase III in adjusting the *R. sphaeroides* transcriptome to changes in the environment, we constructed a mutant strain lacking RNase III activity by exchanging two highly conserved amino acids in the signature motif. An obvious phenotype of this mutant was its lighter red color indicating that formation of photosynthetic complexes differs to the wild type. Indeed, we could confirm lower amounts of bacteriochlorophyll and carotenoids and lower levels of photosynthetic complexes in the mutant. Quantification of several mRNAs encoding structural proteins of photosynthetic complexes or enzymes required for pigment synthesis, revealed that their levels are influenced by RNase III. These results demonstrate, how much a single RNase can influence important physiological processes.