An alternative sigma factor governs the principal sigma factor in *Streptomyces griseus*

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The role of sigma factors to initiate DNA transcription was identified in 1969. Cells have one housekeeping factor and a variable number of alternative sigma factors that possess different promoter-recognition properties. Housekeeping factor or principal sigma factor is required for cell viability. On the other hand, alternative sigma factors have been shown to mediate various cellular responses linked to stress conditions, growth transitions or morphological changes and development. It has long been believed that sigma factors are constitutively produced and are responsible for the transcription of housekeeping genes, including the principal sigma factor-encoding gene itself. In this research, the authors have shown that this is not the case with *Streptomyces griseus.* They found that an alternative sigma factor σ^{ShbA} governed the principal sigma factor σ^{HrdB} throughout the growth.

紹介論文

An alternative sigma factor governs the principal sigma factor in *Streptomyces griseus* Mol Microbiol. 2013 Mar;87(6):1223-36

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要旨

In bacteria, the RNA polymerase holoenzyme comprises a five-subunit core enzyme and a dissociable subunit, sigma factor, which is responsible for transcriptional initiation. The filamentous bacterium *Streptomyces griseus* has 52 sigma factors, including one essential 'principal' sigma factor (σ^{HrdB}) that is responsible for the transcription of housekeeping genes. Here we characterized an alternative sigma factor (σ^{ShbA}), which is highly conserved within the genus *Streptomyces*. A σ^{ShbA}-deficient mutant showed a severe growth defect and transcriptome analysis indicated that many housekeeping genes were downregulated in response to insufficient σ^{ShbA} production. Biochemical and genetic analyses proved that σ^{ShbA} is a major determinant of transcription of the σ^{HrdB} gene. This observation of a principal sigma factor being governed by another sigma factor throughout growth is unprecedented. We found that increasing σ^{ShbA}production with mycelial growth maintained a high σ^{HrdB} level late in growth. Furthermore, a *hrdB*-autoregulatable σ^{ShbA}-deficient mutant, in which the principal sigma factor gene can be transcribed by RNA polymerase containing σ^{HrdB} itself, showed several defects: rapid mycelial lysis in stationary phase in liquid culture and delayed morphological development and impaired streptomycin production in solid culture. From these observations, we discuss the biological significance of control of σ^{HrdB} by σ^{ShbA} in *S. griseus*.