

*Streptomyces* are exceptionally interesting organisms – free-living, soil bacteria which are famous for producing antibiotics and other biologically active compounds. Their life cycle is extremely complex and encompasses multicellular growth and sporulation. Their adaptation to demanding environmental conditions requires precise control of growth and differentiation. An example of such “molecular brake” that stops development under unfavorable environmental conditions is a new regulatory system called SitKR. Earlier studies have shown that this regulatory system is activated by disturbances in the DNA structure. In such conditions SitKR stops the growth of bacteria, as if saying: ”this is not a good time to differentiate – let’s wait”. By removing the SitKR, the bacteria regain the ability to continue growing – as if someone has released the parking brake. Interestingly, SitKR likely not only detects internal problems in the cell but also responds to stress signals from the environment. One of SitKR components – the SitK protein – resembles a sensor in the cell membrane that can detect environmental changes and, consequently, stimulate the second component – SitR. The SitR regulator passes this information on, influencing the activity of many genes, including those involved in antibiotic metabolism and production. The proposed project will shed light on exactly how this system works: what signals activate SitKR and what specific genes SitR controls. Combining molecular biology, genetics and bioinformatics will help to take a closer look at this mechanism. Understanding the role of SitKR may not only expand our knowledge of bacterial adaptation to stress, but also help design better, more efficient industrial strains. And this, in turn, may translate into more effective antibiotic production – which is more important today than ever.