# ZAJEDNIČKI SEMINAR

**22. rujna 2014. (ponedjeljak) u 14:00 sati (točno)**

PMF-fizika, Bijenička cesta 32, Predavaonica 201


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## Relationship between bacterial growth and osmotic pressure


The concentration of chemicals inside the bacterial cytoplasm generates an osmotic pressure, termed turgor, which inflates the cell. In *Escherichia coli*, a sudden increase in external concentration causes a pressure drop across the cell envelope, followed by an active recovery. After recovery, and if the external osmolality remains high, cells have been shown to grow slower, smaller, and at a reduced osmotic pressure. Despite the fact that this active recovery is a key stress response, the nature of these changes and how they relate to each other is not understood.

I will first focus on the changes in cell shape caused by the pressure drop. By looking at individual cells I will show that the type of change a cell undergoes depend on the permeability properties of the solute used to increase the external concentration with respect to the cell's membrane. I will then move on to look at the cell volume and shape recovery that follows the pressure drop. I will show that cells fully recover their volume to the initial, pre-shock value and continue to grow slower immediately after the recovery. I will also show that the cell envelope material properties do not change after an increase in external osmolarity and that cell shape recovers along with the cell volume. Taken together, these observations indicate that the cellular turgor pressure recovers to its initial value and that contrary to previously thought, it is not responsible for the reduced growth rates.

Lastly, I will propose that the reason behind the reduced growth rates observed at high external osmolarities lies in changes in cellular energetics. I will present our latest experimental and modelling results that go in favor with this hypothesis.


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Teuta Pilizota studied undergraduate level physics at University of Zagreb, Department of Physics (Croatia) and obtained her PhD in biophysics from University of Oxford, Department of Physics (UK). During her PhD (in collaboration with Dr. Richard Berry and Prof. Judy Armitage) she developed and used an optical trap optimized for single molecule studies of two rotary molecular motors, bacterial flagellar motor and $F_1F_o$-ATPase. For her post-doctoral training she moved to Princeton University (USA), where her research focus moved to single cell studies of bacterial osmoregulatory network (in collaboration with Prof. Joshua Shaevitz). Teuta joined University of Edinburgh (UK) as a Chancellor's Fellow (Assistant Professor) in January 2013. Her group's research focuses on understanding bacterial growth, including osmotically induced growth rate modulations and interaction between osmoregulatory and other bacterial stress response networks. More recently, the group is focusing on dynamics of free energy flows in bacterial cell, in particular free energy maintenance strategies during exposure to various forms of stresses.