



How does *Listeria monocytogenes* adapt to different conditions through gene regulation?



My name is **Ibrahim Sultan**, I am 24. I have a joint master degree in applied mathematics in life sciences from university of L'Aquila in Italy and Hamburg University in Germany, my bachelor degree was in Electrical Engineering and obtained from MSA University in Egypt. My subject of study and interest is the applications of mathematics in biology. Currently I am an Early-Stage Researcher in INRA, as well as a Ph.D. student in Paris-Saclay University in the Doctoral School "Dynamics of living systems" and working on constructing a mathematical model describing the gene regulation network in a bacteria called *Listeria monocytogenes*, this will be done using statistics beside other mathematical tools.



Objectives

The aim of the project is the understanding of the gene regulation network and the mechanisms by which the bacteria *L.monocytogenes* converts environmental signals into output responses. To do so we need to apply a series of experiments on the bacteria in different environments and against wide range of conditions ranging from soil to food and including the bacteria response to the lack of oxygen and light and study the bacteria response to those conditions. In each condition the bacteria regulate a certain combination of genes. We are interested to know which genes have been regulated together and through which promoter, to do so we measure the activity of the genes which have been used by the bacteria in each experiment.

Expected results

Assuming that the genes which have similar activity through a wide range of experiments have a common promoter, it is important to measure which genes are close to each other (according to their activity through the all experiments) and afterwards group the similar genes through a statistical tool called clustering. The next step afterwards is to search inside each group of genes (cluster) for useful information about how they are regulated, this information such as when and how the genes are regulated, which proteins are used by the bacteria to regulate which genes, will by turn help us understand the bacteria and predict in which conditions it can be virulent, and will help us to prevent these conditions to avoid any danger.

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