Fitness and gene expression of the erythromycin resistant Escherichia coli population growing in continuous culture in the presence and absence of the antibiotic

Abstract:
Antibiotic resistance of bacteria is a common phenomenon today. Apparently this is a consequence of antibiotics overuse. One possible solution to prevent spreading of the resistance is to reduce the usage of antibiotics. This is, however, a very problematic issue.
Acquiring of resistance genes usually imposes a penalty to bacterial fitness, meaning tha the bacterium is handicapped under normal conditions without the selection pressure of the antibiotic. However, it has been shown that bacteria can overcome this handicap thanks to mutations and raise their fitness so that they even outfit the original strain. This study targets this phenomenon in detail.
We have been growing erythromycin resistant E.coli strain in continous culture in presence of erythromycin for c. 100 hours. For comparison, we also carried out a parallel cultivation without the antibiotic. We regularly monitored the process by sampling and measuring the optical density. No constant trend physiology of the culture was observed; instead, the results were highly varying in time.
We selected four samples for evaluation of fitness parameters, namely doubling time, living population size, resistance and rate of translation. We analysed cell free proteins from the samples using 2D electrophoresis, scanned the gels and used the PD Quest program to compare protein profiles of the samples. That concluded the first part of experiments. In the second part we considered clones sampled from the colonies in the 68^{th} hour. The clones were differing in resistance to erythromycin. We have evaluated these clones for the same parameters as in the first part. By comparing protein profiles of clones we observed that they differed both quantitatively and qualitatively. 17 proteines were present in the original sample (in 68^{th} hour) but missing from the clones. Furthermore, the more resistant clone missed another 3 proteines compared to the other one. We suspect that these differences in protein profiles contain the key to understanding the mechanism of increased fitness and resistance of bacteria.
This will be a subject of further intensive research.

Klíčová slova:	Key-words:
Escherichia coli	Escherichia coli
Erytromycin	Erythromycin
Zdatnost/ Fitness	Fitness
2D elektroforéza	2D electrophoresis
Proteiny	Proteins
Kontinuální kultivace	Continual cultivation
Rezistence	Resistance