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Abstract

Deinococcus radiodurans: an extremophilic bacterium with high potential for applications in biotechnology

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Abstract:

Deinococcus radiodurans is a gram positive extremophilic bacterium that is tolerant toward a variety of environmental stresses including Ionizing waves, oxidative stresses, dryness, light, and UV. This bacterium is capable of repairing different damages imposed on its DNA content. By having different enzymes including catalase and superoxide dismutase, it could survive the damages induced by hydrogen peroxide and superoxide compounds (1). Also, D. radiodurans has showed to survive DNA damages in outer space for three years. So far, D. radiodurans and its genes have been used in various biotechnology studies. Until now, many studies have been carried out about D. radiodurans genome to investigate its efficacy for producing recombinant industrial strains (2, 3). From the industrial aspect of biotechnology, recombinant expression of the pprI and IrrE genes have shown to efficacy of yeast for biofuel production. Moreover, regarding bioelectricity generation, the expression of IrrE gene from this strain has demonstrated to enhance the efficacy of Pseudomonas aeruginosa-inoculated microbial fuel cells (MFCs) (2, 4, 5). From the medical perspective of biotechnology, the expression of UVSE gene of this bacterium has demonstrated to be effective for repairing CPD and 6-4 pp DNA damages in human cells (6). In the field of environmental biotechnology, the application of this bacteria has provided promising results for biodegradation of radioactive-mixed wastes (7). It is hoped that in the future, the applications of this strain will help the scientists to bring more development in the different branches of biotechnology.

Biography:

Mohammad Moradi started his carrier in biotechnology at Iranian center for blood transfusion Organization in 2015, and since then he has participated in various biotechnology studies, including both medical and industrial biotechnology. He has experienced working with scientists from different centers in Iran, including Iranian center for blood transfusion organization, University of Isfahan, and Zanjan University of medical sciences. He is also interested in using Bioinformatics at different branches of biotechnology and has participated in some bioinformatics studies, too.

Publication of speakers:

1. Jeong S-W, Jung J-H, Kim M-K, Seo HS, Lim H-M, Lim S. The three catalases in Deinococcus radiodurans: only two show catalase activity. Biochemical and biophysical research communications. 2016;469(3):443-8.

2. Helalat SH, Bidaj S, Samani S, Moradi M. Producing alcohol and salt stress tolerant strain of Saccharomyces cerevisiae by heterologous expression of pprI gene. Enzyme and microbial technology. 2019;124:17-22.
3. Ma R, Zhang Y, Hong H, Lu W, Lin M, Chen M, et al. Improved osmotic tolerance and ethanol production of ethanologenic Escherichia coli by IrrE, a global regulator of radiation-resistance of Deinococcus radiodurans. Current microbiology. 2011;62(2):659-64.
4. Wang L, Wang X, He Z-Q, Zhou S-J, Xu L, Tan X-Y, et al. Engineering prokaryotic regulator IrrE to enhance stress tolerance in budding yeast. 2020.
5. Luo J, Li X, Zhang J, Feng A, Xia M, Zhou M. Global regulator engineering enhances bioelectricity generation in Pseudomonas aeruginosa-inoculated MFCs. Biosensors and Bioelectronics. 2020:112269.
6. Helalat SH, Moradi M, Heidari H, Rezaei F, Yarmohamadi M, Sayadi M, et al. Investigating the efficacy of UVSE protein at repairing CPD and 6–4 pp DNA damages in human cells. Journal of Photochemistry and Photobiology B: Biology. 2020:111843.
7. Lange CC, Wackett LP, Minton KW, Daly MJ. Engineering a recombinant Deinococcus radiodurans for organopollutant degradation in radioactive mixed waste environments. Nature biotechnology. 1998;16(10):929-33.

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