

# Key findings of Copper resistant microbes: Can they be useful in bioremediation?

*Recent publications by Oklahoma State University professor, Dr. Noha H. Youssef*

Environmental pollution is one of today’s biggest issues along with figuring out ways to reduce the production of industrial pollution to prevent environmental catastrophe in the coming years. When looking at all the pollution and contamination that is taking place in today’s world, it is not good at all. However, scientists all over the word along with activists have been working towards reversing and lessening the impacts of environmental pollution. An Oklahoma State University professor, Dr. Noha Youssef, is one of those scientists that contributes to the research of bioremediation. In Dr. Youssef’s collaborative research with scientists from Ukraine and here in the US, they discovered copper resistant microbes within different ecological diverse soil samples, where they then conducted a genomic sequencing of the four samples collected to gain insight on what bacteria resided in the samples and the genes that could be responsible for the resistance to copper [2]. Copper pollution resides within distinguished countries all over the world. These copper pollutants come from a variety of sources such as pesticides and industrial wastewaters. The overabundance of copper within our environment is toxic to the ecosystem, particularly our water and soil. In the published article, they “aimed to isolate bacterial strains with greater resistance to copper and sequence their genomes to potentiate discoveries ...of new genetic determinants of copper detoxification” [2]. Initially, they approached the issue with the goals to isolate, and gain data over their relationships towards pH, solubility of Cu (II) compounds, and their redox potential [2]. They found that all 4 isolates were a part of the Pseudomonas genus UKR1&UKR2, P.lactis and P.panacis, then UKR3&UKR4 as P.veronii [2]. These findings of the copper resistant genes were done by 16s rRNA gene analysis, which revealed the 5 copper resistant proteins as well as the components of metal resistance [2]. This research was based in Ukraine with two scientists’ who developed the hypothesis in Ukraine along with another professor here at Oklahoma State, Dr. Patrauchan. In an interview with Dr. Youssef originally noted that she was not a part of this research but was brought into it by Dr. Patrauchan to aid in the genomics part of the research conducted. Dr. Youssef said that “they wanted to see if the bacteria was super resistant to copper and wanted my help in sequencing their genome to see what genes are responsible for this.” Dr. Youssef was then sent the extracted DNA samples from all 4 cultures, then sent them out for sequencing. When considering the importance of the research, Dr. Youssef explained the significance of having isolated cultures is not because they have any specific use, but because it is always good to have them in stock and in this case for the means of possible bioremediation. The genomics is very important in this aspect because in the case of this research, the bacteria samples collected were a part of the Pseudomonas genus, and “as we know, this bacteria along with many others alike are found in diverse environments such as soil.” And with that, Dr. Youssef explained that “having the genomes of these bacteria is important because in environments such as those they can be susceptible to gaining genes via horizontal gene transfer and having full genomes of these bacteria aids in determining where they received this gene, such as the copper resistant gene in the samples.” Although Dr. Youssef is not following up with this publication, she mentions that there is a possibility that the two scientists based in Ukraine would possibly be conducting more experiments on the copper resistant genes in the Pseudomonas samples.

# CITATIONS:

Society, Microbiology. “Bioremediation: The Pollution Solution?” *Microbiology Society*, https://microbiologysociety.org/blog/bioremediation-the-pollution-solution.html.

Havryliuk, Olesia, et al. “Draft Whole Genome Sequence for Four Highly Copper Resistant Soil Isolates Pseudomonas Lactis Strain UKR1, Pseudomonas Panacis Strain UKR2, and Pseudomonas Veronii Strains UKR3 and UKR4.” *Current Research in Microbial Sciences*, vol. 1, 2020, pp. 44–52., https://doi.org/10.1016/j.crmicr.2020.06.002.

“Water Treatment Solutions.” *Lenntech Water Treatment & Purification*, https://www.lenntech.com/periodic/elements/cu.htm.

Zoom Interview with Dr. Noha Youssef done by Author.