

Identification of *Delftia lacustris* Proteins in Response to Cadmium Stress.

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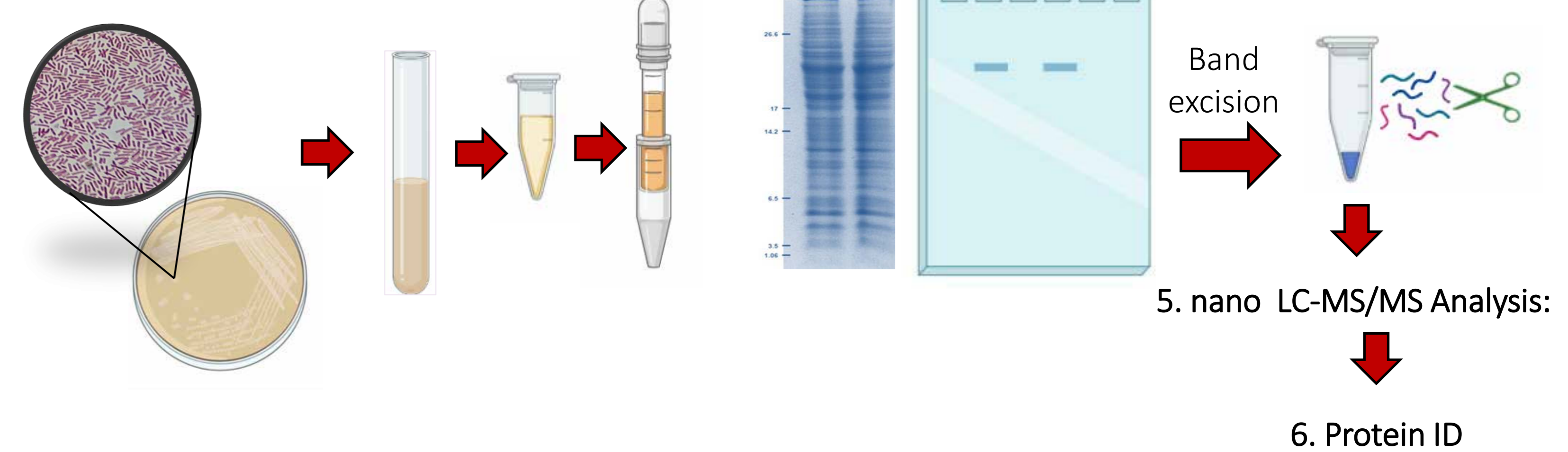
1. INTRODUCTION

Heavy metal contamination such as cadmium, has a negative impact on ecosystems; in the soil it reduces the fertility and the agricultural productivity, additionally it presents serious effects on human health, as the increase of the carcinogenic activity, can also affect kidney function, the immune response promotes and the development of cardiovascular and skeletal diseases. Bacteria have different stress tolerance mechanisms due to the presence of heavy metals, including the production of siderophores, proteins and exopolysaccharides. The aim of this work was to identify *Delftia lacustris* B11CM strain [1] proteins in response to cadmium using nano LC/MSMS proteomic analysis of the bacterial extract without and with cadmium at a concentration of 150 ppm. This research contributes to the fulfillment of sustainable development objectives 3 and 6.



2. MATERIALS AND METHODS

1. Cells growth of *Delftia lacustris* without and with Cd(II) to 150 ppm
2. Protein extraction
3. Electrophoresis (Tricine-SDS-PAGE)-based protein separation
4. In-Gel Protein digestion with trypsin
5. nano LC-MS/MS Analysis:
6. Protein ID

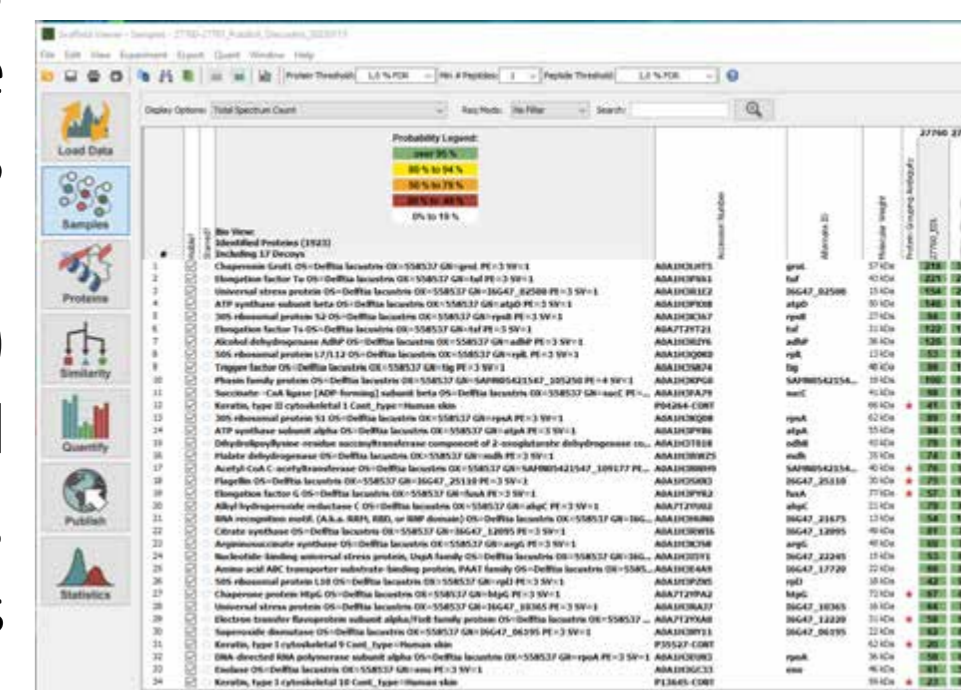


7. Functional Bioinformatic Analysis

The analysis by gene ontology (Gene Ontology) was derived from the UniProt-GO database, the proteins were classified into the categories: Biological Process, Molecular Function and Cellular Component.

Mascot (Matrix Science, London, UK; version 2.8.0). Database *Delftia lacustris* Uniprot (11103 entries).

Scaffold (version Scaffold_5.1.2) was used to validate MS/MS based peptide and protein identifications. criteria: At least 2 unique peptides identified sum score greater than 2X p<0,01 (0.0001% error rate).



3. RESULTS AND DISCUSSION

Protein Identification

The results obtained allowed us to identify 81 differentially present proteins of *Delftia lacustris* extract with Cd(II) to 150 ppm as shown in figure 1A.

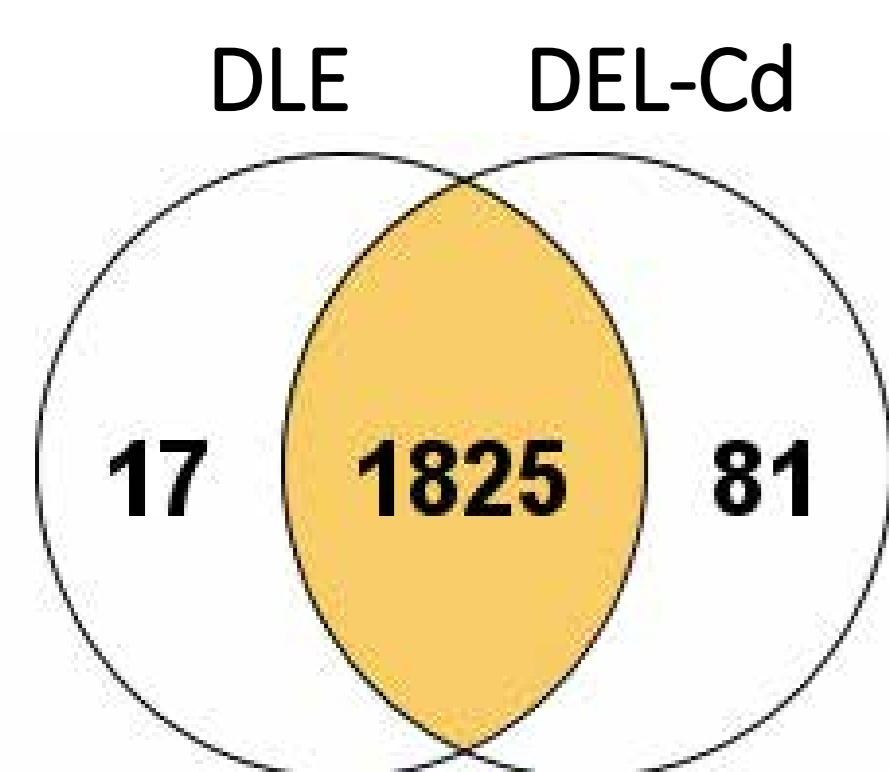
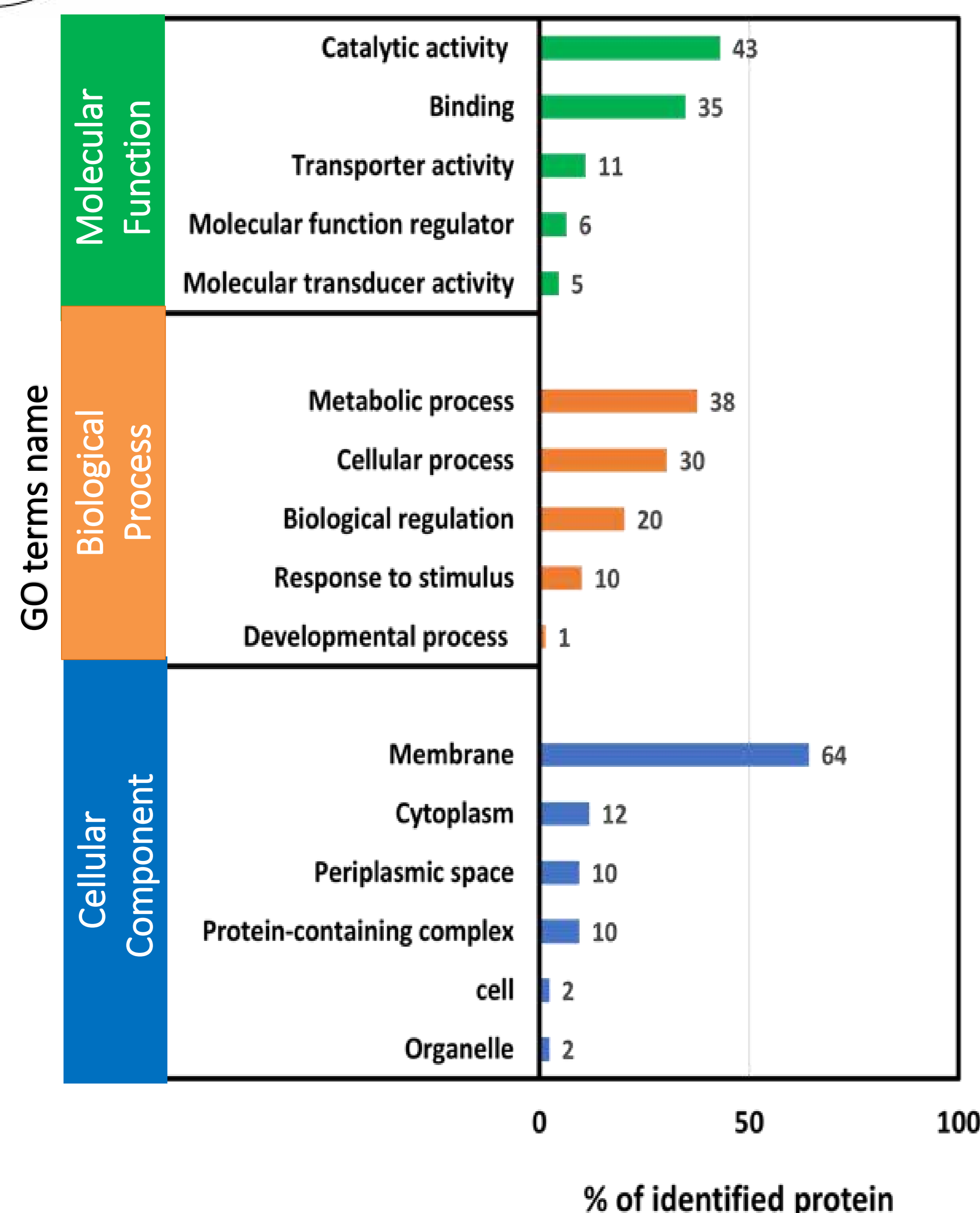


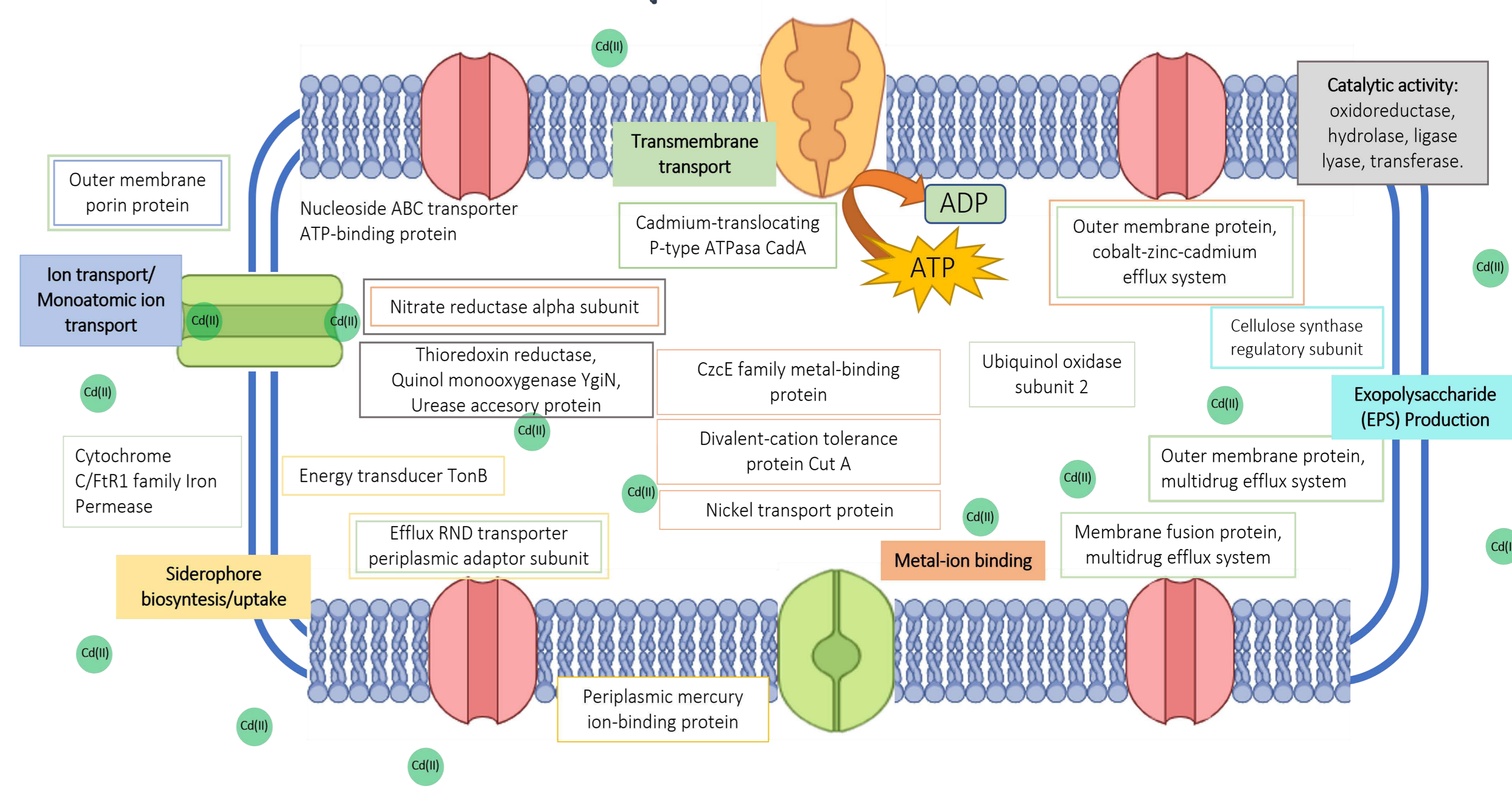
Figure 1. A. Venn diagram provides an overview of key proteins of *Delftia lacustris* extract without (DLE) and with Cd(II) to 150 ppm (DEL-Cd). **B.** Gene Ontology (GO) classification of *Delftia lacustris* proteins in response to Cd(II) stress in the categories: Biological Process, Molecular Function and Cellular Component.



Functional Bioinformatic Analysis

In the functional analysis, regarding the *Molecular Function*, these proteins are involved in catalytic activity (43%), metalloproteins or proteins that bind to different molecules (35%), protein that participate in the transport system of ions or molecules (11%); in *Biological Processes* involved in metabolic processes (38%), cellular processes (30%), biological regulation (20%) and proteins that respond to stimuli (10%). Regarding the *Cellular Component*, the majority of the proteins identified in this category are found in the plasma membrane (64%) (Figure 1B), among others. It is evident that these proteins possibly allow this bacterium to survive in environments contaminated with cadmium, and they are directly related to the tolerance effect, conditions that make them potential to be used as a bioinoculant with agronomic interest or in bioremediation processes.

Proposed Molecular Mechanisms in the response of *Delftia lacustris* to Cd(II) at proteomic level



The molecular mechanisms proposed in response of *Delftia lacustris* to cadmium at the proteomic level, it was done only proteins in the extract with cadmium at a concentration of 150 ppm

CONCLUSION

The identification of proteins in *Delftia lacustris* extracts and proposed molecular mechanisms possibly allow this bacterium to survive in environments contaminated with cadmium, and they are directly related to the tolerance effect, conditions that make them potential to be used as a bioinoculant with agronomic interest or in bioremediation processes.



ACKNOWLEDGMENTS

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REFERENCE

1. Ortiz Ortiz, J. C. ; Ramirez, R. A. ; Pulido, X. ; Varon López, M. 2021. Evaluación de la tolerancia a cadmio y plomo y su capacidad promotora de crecimiento vegetal de microorganismos aislados de relaves mineros . Memorias XXX Reunión Latinoamericana de Rizobiología V Conferencia Latinoamericana de Microorganismos Promotores del Crecimiento Vegetal.