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A proteomic study on the responses to arsenate stress by an acidophilic fungal strain *Acidomyces acidophilus* WKC1

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An arsenic-resistant fungal strain, *Acidomyces acidophilus* WKC1 was isolated from waste roaster pile of a disused tin mine in Cornwall (UK) that was found to contain 18970 mg kg^{-1} arsenic (As). These tin mining areas are inhospitable due their extreme environmental conditions such as acutely acidity and high concentrations of heavy metals/metalloids, particularly arsenic. The *A. acidophilus* WKC1 strain exhibited remarkable tolerance to high arsenic concentration for instance, it can tolerate As(V) up to 22500 mg L^{-1}. A comparative protein responses analysis of *A. acidophilus* WKC1 exposed to arsenic and its control was performed using hybrid quadrupole-Orbitrap mass spectrometer. This proteomics approach revealed the mechanism behind the outstanding resistance and tolerance of *A. acidophilus* WKC1 against arsenic toxicity. When *A. acidophilus* WKC1 strain was exposed for 24 hours to 500 mg L^{-1} of sodium arsenate (Na_2HAsO_4), the enzymatic activities showed increased glutathione reductase, catalase and superoxide dismutase activities but reduced glutathione transferase activity. A total of 262 differentially expressed proteins were detected, of these 175 were up-regulated and 63 were down regulated following exposure to arsenic. These proteins included ones know to be involved in cellular stress responses, energy production, transport and proteins/enzymes synthesis when exposed to arsenic. In addition, 14 proteins were switched off and 10 proteins were switched on in the presence of arsenic. As far as we are aware this is the first report on proteomic study using *A. acidophilus* strain and next generation semi-quantitative mass spectrometry in arsenic resistance.

Biography

Wai Kit Chan has been captivated by science and environmental issues since in high school and became focused on protecting the environment from pollutants. He is currently pursuing his PhD at the Middlesex University under Dr. Diane Purchase. His research focuses on bioremediation in metalloids contaminated soil using extremophiles species, such as fungi, isolated from an extreme environment and the application of proteomics techniques. Prior to enrolling at Middlesex University, he holds a Master's degree in Environmental Management and BSc in Biotechnology both from University of Sunderland.

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