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Systematical approach upon the toxicity of chromium delivered by skin route with functional proteomics

hromium is an emergent class of toxic metal, which is widely used in numerous industrial processes, and it is difficult to avoid contact or absorption through the skin. In natural environments, chromium generally occurs in two forms: trivalent (Cr3+) and hexavalent (Cr6+) states. Piles of studies have indicated that heavy metals such as chromium compounds are closely linked to cytotoxicity and carcinogenicity via the skin. Meanwhile, exposure to chromium usually results in large-scale protein alterations which reflect pathologic states. Thus, merely exploring the genomic data is not sufficient to reveal biological function caused by chromium compounds. In this regard, the impact of chromium on the human health and the underlying pathogenic processes were further revealed with functional proteome tools combined with a network analysis to statistically explore candidate protein targets and related pathways predicted to be changed in the presence of chromium compounds. Our findings showed that the most meaningful changes were observed amongst proteins involved in inflammation, carbohydrate metabolism, endoplasmic reticulum (ER) stress, calcium homeostasis and apoptosis. Pathway analytical tools suggest that Cr6+ might induce the accumulation of misfolded proteins and adverse effects leading to cell apoptosis and liver injury, while Cr3+ was shown to be non-mutagenic and is actually required for normal metabolism. Taken together, we systemically detect the protein profiles as well as to correlate the proteome results with data from other functional studies in the presence of topically applied chromium compounds. The proteins and molecules identified are key components in determining the inflammatory responses, hepatic pathology and carcinogenesis. The current researches provide important information on the protein panel markers and mechanisms associated with chromium cytotoxicity and advanced damage in the public health.

Biography

Tai Long Pan has been committed to Chinese Medicine Therapy upon hepatic diseases as well as toxicology of environmental factors with functional proteome platform for many years. He has also established a feasible model to systematically and effectively identify the panel markers associated with clinical diagnosis and prognosis. In this study, functional proteome analysis of plasma may provide a promising tool for developing therapeutic strategies and can serve as the basis for further research.

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