



Category: Miscellaneous

Cigarette smoke induces metabolic reprogramming in lung cells

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Abstract

Cigarette smoking remains the leading cause of non-small cell lung carcinoma. Studies involving acute exposure of smoke on lung cells revealed induction of pre-cancerous state in lung cells. Recently few studies have reported the chronic effect of cigarette smoke in inducing cellular transformation. Yet no systemic study has been performed to understand the molecular alterations in lung cells due to cigarette smoke. Hence it is both important and necessary to study the chronic effect of cigarette smoke in a temporal setting to understand the molecular alterations. In this study, we carried out TMT based proteomic profiling of lung cells which were exposed to cigarette smoke condensate (CSC) for upto 12 months. We identified 2621 proteins in total, of which 145, 114, 87, 169 and 671 proteins were differentially expressed ($p < 0.05$, 1.5 fold) in 2nd, 4th, 6th, 8th and 12th month respectively. Pathway analysis revealed enrichment of xenobiotic metabolism signaling for the first 8 months of smoke treatment, whereas continued exposure of smoke for 12 months revealed mitochondrial reprogramming in cells which includes dysregulation of oxidative phosphorylation machinery leading to enhanced reactive oxygen species and higher expression of enzymes involved in tricarboxylic acid cycle (TCA). In addition, chronic exposure of smoke led to overexpression of enzymes involved in glutamine metabolism, fatty acid degradation and lactate synthesis. This could possibly explain the availability of alternative source of carbon in TCA cycle apart from glycolytic pyruvate. Our data indicates that chronic exposure to cigarette smoke induces metabolic transformation in cells to support growth and survival.

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