

Significance of Calcium Mobilizing G-protein Coupled Receptor Genes in Non-small Cell Lung Cancer Types

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Introduction

Lung Cancer (LC) is the most common cancer, with over 150,000 deaths estimated to occur in 2016 in the United States. Among non-small cell lung cancer, about 40% are characterized as adenocarcinoma and 10-15% are squamous. Specific biomarkers are being researched to help determine positive gene therapies for the different types of LC. Since this dangerous cancer claims many lives, it is of utmost importance to determine targeted therapies for each type to improve overall prognosis. The aim of this study is determine the significance of protein families in differentiation of squamous cell carcinoma and adenocarcinoma for targeted LC therapy.

Methods

To determine genes and significant pathways, the online tools GeneCards, String-db.org, GEO2R, Gene Expression Omnibus (GEO), and PubMed were used. Dataset GSE41271, chosen from GEO, contained 275 lung tissues samples from LC patients; the subset study group chosen was Caucasian males with smoking history, divided into cases with adenocarcinoma (80 samples) or squamous cell carcinoma (44 samples). The dataset was analyzed using a t-test; the p-value cutoff was set to $2E10^{-5}$ and the log fold change (log FC) cutoff was set at an absolute value of 1.5. Top genes were analyzed for gene interactions using String-db.org; significant interactions were further analyzed with previous studies from PubMed.

Results

After analysis with the above databases, the genes LPAR3, Lysophosphatidic Acid Receptor 3, (p-value $5.78E-12$, log FC 1.54); CHRM3, Cholinergic Receptor Muscarinic 3, (p-value $7.35E-11$, log FC 1.78); and P2RY1, Purinergic Receptor, (p value $8.07E-10$, log FC of 1.53) were increased in squamous LC. In String, the genes were associated, with a GO Biological Process of "phospholipase C-activating G-protein coupled receptor signaling pathway." These genes are coupled to G_q proteins, which are integral to cell function and calcium uptake into the cell through the activation of phospholipase C [1]; calcium uptake is associated with cell motility (a crucial characteristic of the spreading of tumors) through cytoskeletal reorganization [2].

Conclusion

The overexpression of LPAR3, CHRM3, and P2RY1 in squamous cell carcinoma compared with adenocarcinoma of the lung provides the hypothesis that squamous cell carcinoma has higher cell motility than adenocarcinoma, suggesting possible paths for effective gene therapies that can uniquely target these types of LC. Further research is needed to genetically characterize the two types of non-small cell LC to guide a more specific approach to curative therapies.

Keywords: calcium, adenocarcinoma, squamous cell carcinoma, lung cancer, g protein

References

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