



Effects of Heated Tobacco Products' Extract from Cigarette Smoke on the Growth of Lung Cancer Stem Cells

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Abstract

Several types of cancer, including lung cancer, have been linked to an increased risk of smoking by epidemiological studies. Cancer stem cells (CSCs), a minor cell population in tumors that contribute to drug resistance and recurrence, are the source of lung cancer. Aerosols made from heated tobacco products (HTPs) contain nicotine and harmful chemicals. However, the available evidence is insufficient to accurately determine whether HTPs are safer than smoking cigarettes. The effects of cigarette smoke extract (CSE) from HTPs on lung CSCs in lung cancer cell lines were the subject of this study. CSEs increased stem cell marker expression and lung CSC proliferation, according to



Figure 1. qRT-PCR analysis of ALDH1A1 expression in lung cancer stem cells. The graph shows the relative expression of ALDH1A1 mRNA in control cells (1.0) and cells treated with CSE from HTPs (approximately 1.5). Error bars represent standard deviation.

qRT-PCR

Figure 2. qRT-PCR analysis of EMT markers (E-cadherin, N-cadherin, and Vimentin) expression in lung cancer stem cells. The graph shows the relative expression of these markers in control cells (1.0) and cells treated with CSE from HTPs. E-cadherin expression is significantly reduced, while N-cadherin and Vimentin expression is significantly increased.

Results

CSE from HTPs induces the proliferation of ALDH-positive cells

Figure 3. Proliferation of ALDH-positive cells. The graph shows the percentage of ALDH-positive cells in control cells (100%) and cells treated with CSE from HTPs (approximately 150%). Error bars represent standard deviation.

CSE from HTP induces sphere formation

Figure 4. Sphere formation assay. The graph shows the number of spheres formed in control cells (100%) and cells treated with CSE from HTPs (approximately 150%). Error bars represent standard deviation.

CSE from HTP induces the expression of stem cell markers

Figure 5. Expression of stem cell markers. The graph shows the relative expression of stem cell markers (SOX2, OCT4, and Nanog) in control cells (1.0) and cells treated with CSE from HTPs. All three markers show significantly increased expression.

CSE from the HTPs induces the expression of EMT markers

Figure 6. EMT markers expression. The graph shows the relative expression of EMT markers (E-cadherin, N-cadherin, and Vimentin) in control cells (1.0) and cells treated with CSE from HTPs. E-cadherin expression is significantly reduced, while N-cadherin and Vimentin expression is significantly increased.

Discussion

The present study demonstrates that CSE from HTPs induces the proliferation of ALDH-positive cells, sphere formation, and the expression of stem cell markers (SOX2, OCT4, and Nanog) in lung cancer stem cells. Additionally, CSE from HTPs induces the expression of EMT markers (E-cadherin, N-cadherin, and Vimentin), suggesting that HTPs may promote the transition of lung cancer cells to a more stem-like state.

These findings are consistent with previous studies showing that HTPs contain various bioactive compounds that can affect cell growth and differentiation. The induction of stem cell markers and EMT markers by HTPs suggests that these products may play a role in maintaining and promoting the self-renewal of lung cancer stem cells, which is a key feature of cancer progression.

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Conflict of Interest

The author declares no conflict of interest.

References

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