Comparison of epithelial cells inflammatory response from the human respiratory tract after formaldehyde exposure

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BACKGROUND
The respiratory tract is directly exposed to inhaled environmental pollutants such as chemicals. Formaldehyde (FA) is a ubiquitous indoor air pollutant known as irritant. Some epidemiological studies revealed an association between FA exposure at low levels and respiratory diseases, especially in young children[1][2][3]. These results do not allow demonstrating causality. Biological proofs are necessary to confirm the impact of this pollutant on the biological response of human airway respiratory cells.

RESULTS

A. AIRWAY EPITHELIAL CELLS

Primary epithelial nasal cells (hAECN, Epithelix®) seeded on insert in hAEC medium, 5x10^4 cells/insert

Bronchial cells (BEAS-2B, ATCC, USA) seeded on insert in Ham F12 medium, (5% FCS) 4x10^4 cells/insert

Alveolar cells (A549, ATCC, USA) seeded on insert in Ham F12 Medium, (5% FCS) 2x10^4 cells/insert

B. AIR-LIQUID EXPOSURE SYSTEM

- Cells were exposed in a Vitrocell® module at the air-liquid interface to a dynamic and continus air flow (2 or 5 mL/min)

C. PROTOCOL OF EPITHELIAL CELLS EXPOSURE

Comparison of epithelial cells inflammatory response from different parts of the human respiratory tract.

Cellular Viability

Alveolar A549, bronchial BEAS-2B cell lines and human nasal primary cell cultures hAECN were exposed in an air-liquid interface with AIR or FA (50 µg/m^3) during 30 min for A549 and BEAS-2B, 60 min for hAECN.

Whatever the experimental conditions and cell type, cellular viability was unchanged after 24 h of exposure.

Inflammatory response

24 h after exposure, cytokines production in the cellular supernatant was measured. Basal level corresponds to 24 h cytokine production of cells without exposure.

IL-8 production 24 h after AIR or FA exposure.

MCP-1 production 24 h after AIR or FA exposure.

CONCLUSION

Nasal epithelium is first in contact with inhaled pollutants and the first defensive barrier. The use of human nasal primary culture cells to investigate the cellular inflammatory response to FA exposure (50 µg/m^3) is more appropriate than immortalized cell lines to mimic the effect of inhaled pollution. This cellular model is relevant to assess the impact of repeated exposures at regular time intervals in order to get close to the real conditions.

REFERENCES :