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Definitions

- **Hexavalent Chromium (Cr[VI])**: A toxic form of chromium that can cause cancer.
- **Aromatic Amines**: Chemical compounds, such as 4-aminobiphenyl (4-ABP) and β-naphthylamine (BNA), that can be carcinogenic.
- **Genotoxicity**: The ability of a substance to damage genetic information in cells, leading to cancer.
- **N-acetyltransferase 1 (NAT1)**: An enzyme that helps process and detoxify certain chemicals in the body.
- **CYP1A1**: An enzyme involved in the metabolism of various substances, including carcinogens.

Key Findings

- Exposure to hexavalent chromium (Cr[VI]) increases the activity of the NAT1 enzyme in human lung cells.
- This increased NAT1 activity leads to higher metabolism and genotoxicity of aromatic amines like 4-ABP and BNA.
- Cr(VI) also increases the expression and activity of the CYP1A1 enzyme, which is involved in the initial steps of metabolizing aromatic amines.
- The study highlights the potential for combined exposure to Cr(VI) and aromatic amines to increase cancer risk.

Introduction

The study investigates how hexavalent chromium (Cr[VI]) affects the metabolism and genotoxicity of two aromatic amines, 4-aminobiphenyl (4-ABP) and β-naphthylamine (BNA), in human lung cells. Both Cr(VI) and aromatic amines are known carcinogens, often found together in industrial settings and tobacco smoke.

Main Content

Background

Lung cancer is a leading cause of death, and exposure to certain chemicals can increase cancer risk. Hexavalent chromium (Cr[VI]) and aromatic amines are both found in various industrial processes and

are known to cause cancer. The study aims to understand how these chemicals interact and affect the risk of lung cancer.

Methods

- **Cell Culture**: Human lung epithelial cells (BEP2D) were used to study the effects of Cr(VI) and aromatic amines.
- **Exposure**: Cells were exposed to different concentrations of Cr(VI), 4-ABP, and BNA.
- **NAT1 and CYP1A1 Activity**: The activity of NAT1 and CYP1A1 enzymes was measured to understand how Cr(VI) affects the metabolism of aromatic amines.
- **Genotoxicity Assays**: Tests were conducted to measure DNA damage in the cells.

Results

- **NAT1 Activity**: Cr(VI) exposure increased the activity of the NAT1 enzyme, which helps process and detoxify chemicals.
- **CYP1A1 Activity**: Cr(VI) also increased the expression and activity of the CYP1A1 enzyme, which is involved in the initial steps of metabolizing aromatic amines.
- **Genotoxicity**: Combined exposure to Cr(VI) and aromatic amines resulted in higher levels of DNA damage compared to exposure to the chemicals alone.

Conclusion

The study shows that hexavalent chromium (Cr[VI]) increases the activity of enzymes involved in the metabolism of aromatic amines, leading to higher levels of DNA damage in human lung cells. This suggests that combined exposure to Cr(VI) and aromatic amines could significantly increase the risk of lung cancer. The findings highlight the need for further research to understand the interactions between different carcinogens and to develop strategies to reduce exposure and cancer risk.

Word Count: 446