2014

The Effects of Carbon Black on Cell Viability

Abigail Calixto  
*Pepperdine University*

Jay Brewster  
*Pepperdine University*

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Carbon black (CB) is a type of nanoparticle that is found in air pollution and is known environmental toxin. The purpose of this work is to evaluate whether CB exposure activates cell death via apoptosis in cultured cell lines, supporting future work focused on assessing the signaling pathways that might be induced by this exposure. Using adenosaccharinum human alveolar basal epithelial (A549) and baby hamster kidney (BHK-21) cells, we hypothesized that carbon black exposure causes cell death and potentially stress signaling via the endoplasmic reticulum (ER). The cells were exposed to CB and data collected for varied doses and time points. In order to measure cell apoptosis, the terminal deoxynucleotidyl transfrase dUTP nick end labeling (TUNEL) method was used to detect apoptosis-associated DNA fragmentation. A 5-day exposure of CB at 100 μg/ml generated significant reduction in cell survival and elevated numbers of TUNEL positive cells. Future work will focus on assessing the stress pathways induced in these cells.

### Results

#### Figure 1. Quantification of A549 when exposed to CB

<table>
<thead>
<tr>
<th>Treatment</th>
<th>A549 Cell Count</th>
<th>TUNEL Assay</th>
<th>% Apoptosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4 ug/ml</td>
<td>57,519</td>
<td>3,174</td>
<td>5.48</td>
</tr>
<tr>
<td>1.2 ug/ml</td>
<td>6,519</td>
<td>6,519</td>
<td>3.24</td>
</tr>
<tr>
<td>10 ug/ml</td>
<td>4,999</td>
<td>4,999</td>
<td>3.24</td>
</tr>
<tr>
<td>100 ug/ml</td>
<td>3,700</td>
<td>3,700</td>
<td>3.24</td>
</tr>
</tbody>
</table>

#### Figure 2.Crystal violet staining of BHK-21 and A549 after 5 days of treatment

- **A549 Crystal Violet**
- **BHK21 Crystal Violet**

#### Figure 3. The TUNEL method was used to quantify apoptosis in BHK-21 and A549. The TUNEL method consists of terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) and DNA ends with a nucleotide that contains fluorochrome labels. Apoptotic cells contain DNA fragmentation, and when analyzed under UV light, apoptotic cells will glow green.

### Conclusion

- Significant reduction in A549 with crystal violet when exposed to a range of 10-100 μg/ml CB.
- Significant reduction in BHK-21 when exposed to 100 CB μg/ml exposure.
- TUNEL method detected apoptosis in BHK-21 and A549.
- Future studies consist of assessing signal transduction induced by NP.

### Literature Cited


### Acknowledgments

I would like to thank the National Science Foundation for providing funds for my research this summer. I would also like to express a special thank you to my mentor Dr. Brewer for helping me with my research throughout the summer as well as all of the faculty members and students participating in SURF.