ABSTRACT

A successful device will hold two optical probes so that they can be prepared and inserted in a cancerous tumor. This device should have the following characteristics:

**Physical/Operational Characteristics**
- Fix two optical probe needles 3mm apart, tip-to-tip
- Allow for >2mm penetration of epidermis
- Maintain rotational/translational rigidity
- Minimize invasiveness
- Be reusable

**Production Characteristics**
- Allow for simple manufacturing
- Be manufactured within a budget of ~$100

INTRODUCTION

Radiation Therapy and Cancer
- Current methods focus on controlled, uniform dose (illustrated)
- Our clients method attacks tumor as it changes throughout treatment

Hypoxia as Dominant Factor
- Tissue damage from radiation comes largely from secondary oxygen free-radicals (3)
- Tracking oxygen levels indicates where radiation will be more or less damaging
- More oxygenated parts of the tumor will be more affected as a result of the increase in radical formation.

DESIGN CRITERIA

**Our design was tested to determine the force with which it could hold the needles both individually and with both needles in the device.**

<table>
<thead>
<tr>
<th>Trial</th>
<th>Single Needle Removal Force From Clip (N)</th>
<th>Double Needle Removal Force From Clip (N)</th>
<th>Chicken Breast Insertion Force (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.09</td>
<td>3.17</td>
<td>0.19</td>
</tr>
<tr>
<td>2</td>
<td>2.01</td>
<td>3.56</td>
<td>0.20</td>
</tr>
<tr>
<td>3</td>
<td>2.05</td>
<td>3.09</td>
<td>0.18</td>
</tr>
<tr>
<td>4</td>
<td>2.02</td>
<td>3.91</td>
<td>0.20</td>
</tr>
<tr>
<td>5</td>
<td>2.06</td>
<td>2.98</td>
<td>0.22</td>
</tr>
<tr>
<td>Average and Standard Deviation</td>
<td>2.046 &amp; 0.032</td>
<td>3.34 &amp; 0.385</td>
<td>0.198 &amp; 0.015</td>
</tr>
</tbody>
</table>

These results were then compared to simulations of removal from real tissue.

"Low clamping force is still much larger than the force needed to remove from flesh"

TESTING

**Future Work**
- In-mouse testing with Dr. Kissick and make any updates that are needed.
- Possible work on a device more suited for human testing.
- Human device would likely be smaller, more ergonomic, and biocompatible.
- Possible work on an updated device that is capable of having the needles removed for prolonged testing with the fibers.

ACKNOWLEDGEMENTS

**REFERENCES**